

REPORT  
OF THE  
DEPARTMENT OF HEALTH  
OF THE  
PANAMA CANAL  
FOR THE  
CALENDAR YEAR 1916

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D. C. HOWARD

Lieut. Colonel, Medical Corps, United States Army  
Chief Health Officer, Balboa Heights, Canal-Zone

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WASHINGTON  
1917



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## LETTER OF SUBMITTAL.

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BALBOA HEIGHTS, CANAL ZONE, January 22, 1917.

Lieut. Col. JAY J. MORROW,  
*Acting Governor the Panama Canal,*

*Balboa Heights, Canal Zone.*

SIR: I have the honor to submit the following report of the operations of the department of health for the calendar year 1916.

Very respectfully,

D. C. HOWARD,  
*Chief Health Officer.*

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### GENERAL REMARKS.

Health conditions on the Isthmus during the year have been excellent.

A case of smallpox in a West Indian sailor recently landed was admitted to Ancon Hospital from Panama City on October 18. The disease was contracted prior to his arrival on the Isthmus. Two secondary cases resulted, both in children living in an adjoining room from which the first patient came. Two cases recovered, but the third, a 6-weeks old infant, died November 30. No further cases appeared. With this exception, no cases of quarantinable disease originated on or were brought to the Isthmus during the year.

Two cases of anterior poliomyelitis appeared in the Balboa district on December 12, both in children of the same family. The last previous case of the disease on the Isthmus was in 1912. No secondary cases have appeared.

The annual physical examination of school children in the Canal Zone was completed in November, a total of 1,038 being examined, in whom 918 defects were noted, treatment being required in 682 cases. Free treatment (except dental) is given for defects discovered at these examinations, and the value of this practice is increasingly evident.

The third annual physical examination of gold employees was made late in the year. The results have not yet been tabulated, but its value both to the individual and the service is generally recognized.

Four thousand two hundred persons were vaccinated for smallpox in the terminal cities and the Canal Zone during the year, and 16,681 were vaccinated aboard incoming vessels.

A census of the Canal Zone taken by the police department in June, 1916, showed a population of 31,048, a gain of 1,122 over the previous census taken in July, 1915. The strength of the military

at the end of the year was 7,060. While exact figures are not available, it is believed that the population has increased also in both terminal cities during the year. Over one-half of the employees of the Panama Canal live in the terminal cities.

While the death rates in the terminal cities from most diseases are lower than in cities in the United States, the exceptions are found in the higher death rates for tuberculosis, especially among the blacks, and in children under 1 year of age. The general good health of the cities of Colon and Panama, with the two exceptions noted, is due in part to the most excellent water supply piped to all houses and a proper sewerage system. Without constant anti-mosquito work, however, malaria would be very prevalent, as all houses in the terminal cities are unscreened. Racial predisposition, overcrowding, and insufficient food are responsible in great part for the high death rates from tuberculosis in the terminal cities. The problem, therefore, is an economic one in great part rather than sanitary. Steps have been taken by the health department in Panama, assisted by local charitable organizations, to carry on work along educational and preventive lines to improve economic and other conditions where possible in the effort to reduce the tuberculosis rate in Panama. It is necessary that the available area for new buildings be increased in Panama City, and it has been recommended that the water mains and sewers be extended to the "Savanas" district to permit of expansion of the city in this direction. At present building permits can not be issued for construction in unimproved districts.

The high infant mortality rate in Panama City is closely related to poverty and malnutrition. There has been established in connection with the health office a bureau of infant welfare, and encouraging results are being reported of the work already done. Plans are in preparation for extending these activities through the promised support of influential Panamans who are deeply interested in the work of this bureau.

The revised and amended "Sanitary Rules and Regulations" for the terminal cities, which were submitted to the Panama Government in July, 1915, with request for publication, after many months of correspondence and conferences, were finally adopted and published as official decrees, the last under date of September 14, 1916. All sanitary ordinances, including those recently adopted, have been compiled and published in booklet form and are now in full force in both cities. Until quite recently this department has not had the full cooperation and support of the Panama Government in the matter of collection and accounting of fines and penalties imposed by the health officers of Panama and Colon for violation of sanitary regulations. It was necessary a few months ago to take the matter up with the Panama Government, calling attention to the large proportion of fines which remained uncollected and to the failure of the municipal treasurer to carry the collected fines as an "emergency fund, to be used only in special cases for sanitary purposes," as required under the sanitary code. This matter has not yet been settled, but a better spirit of cooperation appears evident in other matters, and a satisfactory adjustment is anticipated soon.

## VITAL STATISTICS.

## EMPLOYEES.

The health of employees in 1916 was better than in any previous year during the history of the canal.

The average number of employees on the rolls of the Panama Canal, the Panama Railroad, and contractors doing work for the Panama Canal, for the year was 33,176, as compared with 34,785 for 1915, and 44,329 for 1914.

The total admission rate to hospital and quarters was 282.76<sup>1</sup> as compared with 320.20 in 1915, 401.54 in 1914, and 519 in 1913. (See Chart I, p. 35.) There was a net reduction of 12 per cent in the admission rate from that of the previous year, which was then the lowest rate of record. For disease alone, the admission rate to hospitals was 103.72, as compared with 143.82 in 1915, 182.57 in 1914, and 246.91 in 1913. The total admission rate to hospitals only was 140.43 as compared with 186.17 for 1915, 244.49 for 1914, and 351.10 for 1913.

The total death rate was 6.03 as against 5.77 in 1915, 7.04 in 1914, and 8.35 in 1913. (See Chart II, p. 36.) The death rate for disease alone was 4.58 in 1916, as against 4.05 in 1915.

The constantly noneffective rate from all causes was 9.20 for 1916, which is the lowest rate of record, as compared with 10.28 for 1915, and 12.22 for 1914. (See Chart III, p. 37.)

Of particular interest is the continued improvement in rates for malaria, which disease heretofore has been the principal cause of disability among employees. Malaria has now been supplanted as the leading cause of admission by the group of venereal diseases. The admission rate to hospital and quarters in 1916 was 16.49 as compared with 51.20 for 1915 (see Chart IV, p. 38), a reduction of 68 per cent from the rate of the latter year. There were only two deaths from malaria among employees, both blacks, making a death rate of 0.06 in 1916, as compared with 0.23 in 1915 (see Chart V, p. 39), a net reduction of 73 per cent. There were no deaths from malaria among American employees; 0.59 employees per 1,000 were constantly sick with malaria in 1916, as compared with 1.19 for 1915. With the completion of the permanent sanitary work now in progress, it is believed that malaria will be practically eradicated from our sanitized districts and the terminal cities, if the present standard of maintenance work is continued. Cases of the disease may be expected to occur now and then among laborers working in outlying districts in which antimosquito work is not carried on, as with clearing gangs, mapping parties, etc., unless rigid individual precautions are taken.

The admission rate for dysentery was: Amebic, 0.24; bacillary, 0.03; clinical, 0.33. The corresponding rates for 1915 were 0.14, 0.06, and 0.55; and for 1914, 0.38, 0.18, and 1.24.

The admission rate for typhoid fever was 0.66, as compared with 0.11 in 1915, and 0.52 in 1914. There were three deaths from typhoid fever among employees during the year.

<sup>1</sup> All morbidity and mortality rates are computed as equivalent annual per 1,000.

The five diseases causing the highest number of hospital admissions, with their rates, were as follows:

	Admis-sions.	Rate.
Venereal diseases.....	521	15.70
Malaria.....	502	15.13
Diseases of the eyes and adnexa.....	122	3.68
Tuberculosis (various organs).....	107	3.22
Influenza.....	94	2.83

The five diseases causing the the highest number of deaths, with their rates, were as follows:

	Deaths.	Rate.
Tuberculosis (various organs).....	36	1.09
Pneumonia (including lobar and broncho).....	31	.93
Bright's disease (chronic nephritis).....	20	.60
Organic disease of the heart.....	12	.36
Cerebral hemorrhage.....	9	.27

There were 36 deaths from tuberculosis among employees against 27 in 1915; from pneumonia 31 deaths against 25 in 1915. The increase in the number of deaths from these two diseases accounts for the slightly higher death rate for 1916.

#### EFFECTS OF RACE.

The admission rate to hospitals and death rate for disease for white employees were 267.35 and 3.29, as compared with 77.70 and 4.79 for black employees. The noneffective rate for disease and injuries for white employees was 17.76, as compared with 7.84 for black employees.

The admission rate to hospitals and quarters for malaria was 39.54 for whites, as compared with 12.82 for black employees.

The admission rate to hospitals for disease for Americans was 209.81; the death rate for disease was 1.67; the admission rate for malaria to hospitals and quarters was 27.62.

#### EFFECTS OF SEASON.

The highest death rates for disease occurred in the months of April and December, and the lowest in July and August. The highest admission rates to hospitals for disease were in January and February, and the lowest in September and November.

## CANAL ZONE.

[Employees and nonemployees.]

With an average population of 31,447 in the Canal Zone, there was a total of 343 deaths during the year. Of these, 290 deaths were from disease, giving a rate of 9.22, as compared with 11.30 for 1915 and 13.24 for 1914.

The birth rate for the year was 20.42. The infant mortality rate, based upon the number of births reported for the year, was 42 for white and 149 for colored children, with a general average of 121.

The percentage of stillbirths to total births was 6. Of the total deaths from disease, the percentage under 5 years of age was 43.

Below is a table showing the death rates for the Canal Zone from 1905 to 1916, inclusive, including deaths from all causes among both employees and nonemployees:

Year.	Population.	Deaths.	Rate per 1,000.	Year.	Population.	Deaths.	Rate per 1,000.
1905.....	23,463	828	35.29	1911.....	90,434	1,385	15.32
1906.....	34,095	1,700	49.86	1912.....	79,279	1,129	14.24
1907.....	54,036	1,708	31.60	1913.....	61,700	1,047	16.97
1908.....	67,146	1,273	18.95	1914.....	46,379	710	15.31
1909.....	76,900	1,025	13.33	1915.....	31,946	410	12.83
1910.....	86,465	1,251	14.47	1916.....	31,447	343	10.91

## PANAMA CITY.

The population of the city, according to the census of December, 1915, was 60,778, among whom there were a total of 1,765 deaths. Of these, 1,702 deaths were from disease, giving a rate of 28, as compared with 28.97 for 1915 and 32.85 for 1914.

There were 2,598 births reported for the year, giving a rate of 42.75. The infant mortality rate, based upon the number of births reported during the year, was 237. The percentage of stillbirths to total births was 9.

Of the total deaths from disease, the percentage under 5 years of age was 51.

Herewith is a table showing the death rate in Panama City from 1905 to 1916, inclusive, including deaths from all causes among both employees and nonemployees:

Year.	Population.	Deaths.	Rate per 1,000.	Year.	Population.	Deaths.	Rate per 1,000.
1905.....	21,984	1,447	65.82	1911.....	46,555	1,456	31.27
1906.....	25,518	1,142	44.75	1912.....	47,057	1,380	29.33
1907.....	33,548	1,156	34.45	1913.....	47,172	1,507	31.95
1908.....	37,073	1,292	34.83	1914.....	53,948	1,863	34.53
1909.....	40,801	1,038	25.44	1915.....	60,373	1,810	29.98
1910.....	45,591	1,446	31.72	1916.....	60,778	1,765	29.04

## COLON.

The population of the city, according to the census of December, 1915, was 24,693, among whom there were a total of 696 deaths; of these deaths 662 were from disease, giving a rate of 26.81, as compared with 20.59 in 1915 and 24.20 in 1914. The increased death rate shown for Colon over last year is more apparent than real. The number of deaths was practically the same, but the rate last year was based on a population of 29,331, while for this year on 24,693, considerably less than the actual population.

Herewith is a table showing the death rate in Colon from 1905 to 1916, inclusive, including deaths from all causes among both employees and nonemployees:

Year.	Popula-tion.	Deaths.	Rate per 1,000.	Year.	Popula-tion.	Deaths.	Rate per 1,000.
1905.....	11,176	553	49.48	1911.....	19,947	527	26.42
1906.....	13,651	702	51.42	1912.....	20,174	493	24.44
1907.....	14,549	571	39.24	1913.....	20,232	489	24.17
1908.....	15,878	418	26.32	1914.....	23,265	590	25.36
1909.....	17,479	396	22.65	1915.....	29,331	640	21.82
1910.....	19,535	514	26.31	1916.....	24,693	696	28.19

The birth rate for the year was 33.90. The infant mortality rate, based upon the number of births reported during the year, was 228. The percentage of stillbirths to total births was 7. Of the total deaths from disease, the percentage under 5 years of age was 42.

## DIVISION OF HOSPITALS.

## ANCON HOSPITAL.

The first unit of the permanent hospital, section "A," was turned over for occupancy by patients in June. All white American male patients were taken care of in this section.

The following hospital buildings were demolished to make way for new construction:

Building No. 287 (board of health laboratory), on site of which the permanent dispensary is being erected.

Buildings 253, 255, and 257 (wards 1 and 2, and service building), on whose site is being erected the second unit of the permanent hospital—section "B."

Building 231 (attendants' quarters), to make room for type 17, revised, gold quarters for quartermaster's department.

Building 235 (wards 13 and 14, and eye and ear clinic and operating room), on the site of which the permanent board of health laboratory is being erected.

The above new hospital buildings will be ready for occupancy about March 1, 1917.

The present crematory was turned over by the building division in January, 1916, and has been in operation throughout the year.

New boundary lines were defined for the hospital reservation, which removed the following houses from the limits previously obtaining: Nos. 201, 518, 520, 522, 334, and 335.

*Physicians and nurses.*—In 1914 there was a reduction in the force of all employees in this hospital because of a reduced number of patients and because it was expected that the number would continue to decrease with the anticipated reduction of the canal force.

However, in 1915 the minimum number of patients was reached, and since that date there has been a gradual increase in the number of patients. The total number of hospital days treatment for 1916 was 270,294, as against 268,945 for the preceding year. As a result, all departments of the hospital have been constantly running with the minimum number of employees necessary to do the work. This has been especially true as regards physicians and nurses. Consequently there are many occasions when the demands on the personnel are greater than they should be to produce efficient results.

Two physicians in addition to those now authorized are needed. Another rating, with increased pay, is also recommended for such physicians as have demonstrated their efficiency. Unless this is done, it will be impossible to retain good men; better inducements and prospects being offered in other places.

Four nurses, in addition to the present allowance, would relieve the present conditions. Two head nurses, one as supervising night nurse, are desired, but nurses for these positions can not be spared under present conditions.

There were no important changes in the nurse corps during 1916 except the appointment of five head nurses and a change in rating, giving nurses subsistence while on leave.

*Transportation.*—The only daily animal transportation at present in use is a double team used two hours each day to meet the hospital cars on the noon trains, the balance being replaced by motor transportation consisting of—

Date placed in service:

March, 1915.....	1-ton truck.
December, 1915.....	1½-ton truck.
September, 1915.....	Hearse.
April, 1916.....	Heavy chassis ambulance.
June, 1916.....	1-ton trailer.
August, 1916.....	Light chassis touring car.
October, 1916.....	Light chassis ambulance.

The replacement of animal by motor transportation at Ancon Hospital has effected a saving for the year of approximately \$3,500, including depreciation.

*Grounds.*—The usual care was taken of lawns, gardens, plants, hedges, etc., and considerable work was involved in replanting due to new construction. Every effort possible was made to save plants for use around the new buildings when completed.

The organization of the hospital has been improved, the work of the various clinics coordinated, and all service is being rendered at a high standard of efficiency.

Herewith following is a statistical summary of some of the work performed during 1916:

Patients admitted to Ancon Hospital during year.....	9,116
Patients admitted to Corozal Hospital during year.....	225
Chronic patients admitted to chronic ward.....	26
Crippled employees admitted to Corozal farm.....	59
	_____
Major surgical operations.....	1,465
Minor surgical operations.....	1,333
Eye and ear operations.....	622
	_____
Refractions.....	3,420
Obstetrical cases delivered.....	1,378
Deaths during year in Ancon Hospital.....	246
Deaths during year in Corozal Hospital.....	325
	57
	_____
Patients transferred to other hospitals for treatment, etc.....	382
Out-patient department (medical, surgical, eye and ear clinics):	151
Total visits.....	13,888
Prescriptions written.....	6,289
Average number of physicians on duty, hospital and dispensary.....	22
Average number of nurses on duty, hospital and dispensary.....	67
Average number of attendants on duty, hospital and dispensary.....	101

*Enlisted men treated at Ancon Hospital.*

	1916	1915	1914	1913
Number of admissions.....	1,937	1,771	1,458	394
Days relief furnished.....	28,519	24,643	19,506	5,850
Number constantly sick.....	78.13	67.51	53.40	16.00

*Expenditures and revenue received from patients.*

	1916	1915	1914	1913
Operating expenses.....	\$406,390.70	\$382,195.66	\$493,440.84	\$535,112.05
Capital expenses.....	10,797.84	9,152.29	5,173.55	7,062.04
Total expenses.....	417,188.54	391,347.95	498,636.39	543,174.09
Revenues.....	227,021.78	230,256.70	231,392.32	208,325.00
Net operating expense.....	179,368.92	151,938.96	262,068.52	326,787.05

**COROZAL HOSPITAL.**

Corozal Hospital has continued under the general supervision of the superintendent, Ancon Hospital. Great improvements have been made in the hospital and farm during the year as the result of a general reorganization.

The following permanent buildings were added to the hospital during the calendar year: A modern concrete fly-proof compost pit; a carpenter shop; a modern chicken house, with concrete base, capacity 2,000 chickens; the pigeon house was improved by addi-

tion of a shelter shed; and an addition to the piggery, doubling its capacity, was completed.

A steam plant, consisting of boiler, pipe line, and sterilizer, was completed. This plant is used in connection with the proper sterilization of all milk containers, pasteurization of milk, steam cooking in the hospital kitchen, the disinfection of beds and bedding, and will also be used in connection with the proposed hydro-therapy plant.

The hospital kitchen was enlarged and an attractive dining room provided for physicians and nurses.

*Hospital department.*—There was a total of 268 patients remaining in the asylum on January 1, 1916. During the year the movement of patients was as follows: Two hundred and twenty-two admissions, 118 discharges (including 34 deportations), and 56 deaths, leaving a total of 316 patients remaining at the end of the calendar year. Of the total remaining, 187 were males and 129 females, including 31 male and 20 female nonresidents.

An effort is being made to keep complete records and histories and to provide amusement, exercise, and occupation for the patients.

*Farm department.*—The farm department has been reorganized and the position of assistant farm manager created. The number of cripples on the farm at the beginning of the calendar year was 56, and this number had increased at the close of the year to 66, of whom 10 were whites and 56 colored. No deaths occurred among the cripples during the year.

*Dairy.*—During the first half of the year the method of conducting the dairy was changed and an experienced man, specially trained in dairying, was placed in charge of the dairy and piggery. The standard adopted has been that of the best diaries in the States, and a careful laboratory check of the products is kept up to insure the continued standard of excellence.

The results obtained at the dairy have been beyond all expectation. The daily bacterial count of raw milk averaged less than 5,000 per cubic centimeter and at times as low as 500 per cubic centimeter. Because of the demand for pasteurized milk a pasteurizer was installed. This has reduced the daily bacterial count to an average of less than 100 per cubic centimeter per day. All utensils are sterilized by steam, and every effort is made to supply milk equal if not better than that supplied from any dairy in a temperate climate.

The supply of milk has been greatly increased, so that besides furnishing Ancon, Colon, and Corozal Hospitals we have been able to supply all who have been prescribed milk by a physician. Seventy-eight thousand five hundred and seventy three quarts of milk were sold during the year for a total of \$13,682.72. The total income from the dairy for the calendar year was \$15,357.91. At the end of the year the herd numbered 69 cows, 36 calves, besides 2 registered Jersey bulls.

*Garden.*—The sale of produce from the garden showed a gratifying increase at the end of the year, due to extending the area for garden truck. Flowers and plants had a ready sale all the year. The total income from the garden for the year was \$4,793.38.

*Piggery*.—At the close of the year the piggery included 4 registered boars, 63 hogs, 63 pigs, and 55 sucklings, or a total of 185. The total revenue from this branch for the year was \$1,681.81.

*Poultry*.—The flock numbered 15 cocks and 469 hens at the end of the year, but a shipment of 500 Rhode Island Red hens had already been shipped from the States. With the arrival of the new flock it is expected that all demands for eggs will be supplied. The new flock will be placed in the new concrete chicken house, which was practically complete at the end of the year. Two thousand five hundred and four dozen eggs were sold for a total of \$1,514.98. The revenue from the poultry yard for the year was \$1,737.95.

*General*.—The increased revenue from the farm during the latter part of the year resulted in a net income of several hundred dollars for this department alone for the month of December.

Detailed statistics of Ancon and Corozal Hospitals are shown in Tables VII, XIII, and XV.

#### BOARD OF HEALTH LABORATORY.

A full report of the work of this laboratory during the year will appear in the Proceedings of the Medical Association of the Isthmian Canal Zone, Volume X, for 1917. The work reported is of great interest, and it is regretted that, due to lack of space, it can not be included in full in this report. The more important features of general interest follow:

*Wassermann tests*.—During the year 8,633 Wassermann tests were made on 6,728 individuals, with results as follows:

Positive.....	1,693
Negative.....	5,130

Separating these findings according to race gives the following per cent positive:

White Americans.....	16.4
Spaniards and white natives.....	26.0
Blacks and mulattoes.....	30.0
Total—per cent positive.....	24.8

In addition, Wassermann tests were made on 41 spinal fluids in as many individuals, and of these, 15, or 36.5 per cent, were positive.

*Cultures*.—During the year 913 cultures were examined for *B. diphtheria*. One hundred and one positive cultures were obtained on 53 individuals. The cases were practically all sporadic, evenly distributed over the Isthmus and throughout the year.

*B. typhosus* was recovered from blood cultures 30 times and *B. paratyphosus* 4 times. Of the typhoids, 6 came from Colon, 10 from Panama, 3 from the ships, and the rest from various stations along the line. Of the paratyphosus, 2 came from ships, 1 from Cristobal, and 1 from New Gatun.

Bacteriological examinations of stools and urines were made from the inhabitants of localities in Gatun from which typhoid patients had come on two occasions, but each time with negative results.

The meningococcus was recovered but once during the year. The patient was a soldier who had been on the Isthmus but 30 days. Serum treatment was promptly instituted and recovery uneventful.

*Surgical pathology.*—There were 560 surgical specimens received and examined at the laboratory during the year. The majority came from Ancon Hospital, but some were received from various points along the Canal Zone. Tabular statement of the findings will be published in the complete report. The following are some of the unusual findings:

Two cases of leprosy found in specimens of amputated great toes. Two cases ainhum recorded. Three cases of gangrene of the feet due to chronic arterial disease. One case of Hodgkin's disease. A large chronic spleen which had bled from stellate lines of rupture in its capsule. A rudimentary kidney that had a superimposed inflammatory disease. A thyroid gland that was the seat of inflammatory disease rather than cystic change or tumor growth. A specimen of *Dermatobia cyaniventris* that had been removed from an eyelid.

*Miscellaneous report (surgical and autopsy materials excepted).*—Dark field examinations: Syphilis 54, yaws 4. Placental films examined: Two hundred and thirty-four, seven of them positive for malaria. Leper suspects examined, 30; 14 were positive. Blood films from animals examined: Horses 13, cows 6, dogs 3. Examination of stools 3, urine 1, test meals 5, spinal fluid 1. Films searched for gonococcus: Eye 14, vagina 3. Parasites received for identification: *Filaria immitis*. *Schistosomum hematobium* (ova in urine). *Tenia saginata*. Report on specimen of pleural fluid, 1. Report on examination of a lesion of the hand, 1. Inspection and report on condition of fetus, 8.

#### Animals.

##### Rats examined:

<i>Mus musculus</i> .....	8,988
<i>Mus norwegicus</i> .....	6,094
<i>Mus rattus</i> .....	2,189
<i>Mus alexandrinus</i> .....	130

17,401

##### Hogs examined.....

128

##### Cows and calves examined.....

62

##### Guinea pigs examined.....

16

##### Dogs examined.....

9

##### Rabbits examined.....

5

##### Cats examined.....

3

##### Monkeys examined.....

3

##### Fowls examined.....

2

##### Horses examined.....

1

##### Armadillos examined.....

1

##### Kept under observation:

Hogs.....	4
Dogs.....	4
Cat.....	1

Microscopic report on specimens of animal tissue received 12.

*General remarks.*—Three hundred and twenty-two autopsies were performed during the year, which represents 70 per cent of the bodies passing through the laboratory. It must, of course, be kept

in mind that the mortality rate expressed for one disease during the year does not represent, in full, the morbidity rate of this disease among the individuals that have been autopsied. A disease may be a cause of death in one instance and in another simply a contributory factor. For example, the causes of death listed under the titles of tuberculosis and syphilis do not indicate the true incidence of these diseases among the 322 autopsies.

Syphilis, one of the most important diseases to the clinician and pathologist, escapes indictment as a cause of death more than any other disease that is prone to be followed with important sequalæ that can kill. This disease in its active stages seldom kills but the tendency for it to localize in the vascular system causes lesions which may produce aneurysm, aortic endocarditis, aortitis, cerebral hemorrhage and softening in young adults; or on the other hand some diseases like general paralysis of the insane. Because these lesions are so definitely located in a special system and are so remote from the active stages of the disease, syphilis almost never is indicated as the cause of death while tuberculosis is never lost sight of in this manner. It would appear that when syphilis could be well established by autopsy, and laboratory tests, in conditions like those named above it should be named as the disease which caused death. It is difficult to set hard and fast rules in recording causes of death. Note that many essentially, respiratory, circulatory, nervous, and digestive tract diseases are really placed under some of the general diseases while on the other hand many diseases named under the special systems do not disclose the real etiology of these lesions.

Inspection of the anatomical report will show that during the year 1916 tuberculosis led all other diseases by a very wide margin as a cause of death. It has prevailed almost entirely among the negroes. Seldom did an autopsy disclose in this race an arrested or encapsulated lesion of tuberculosis. Surgical lesions among the negroes were chiefly found in lymph-nodes of the superficial sets and in the male external genitalia. Such a lesion in the bones and joints is far less common than is to be expected among white people. The diseases produced by the pneumococcus (pneumonia, empyema, meningitis, arthritis, pericarditis, etc.) stand next in order as an important fatal factor. Almost on the same level belongs chronic nephritis, and then comes the combined types of external violence. It is reasonable to expect a high rate of chronic nephritis among these young black adult laborers who have been employed under tropical conditions and who have in the past been the victims of acute diseases such as malaria and dysentery, and many of them in addition having suffered from syphilis and gonorrhea.

Malaria, dysenteries, and other tropical diseases are at a very low ebb. Evidence of the first mentioned disease is at times noted at autopsy but it indicates only a latent type. Uncinariasis is much less frequently noted than in former years. Disregarding the causes of death and considering only the most frequent pathological factors discovered at autopsy during the year 1916, tuberculosis and syphilis are found to stand well above all others and offer the difficult elements to be fought in the future. Malaria is still the most important tropical element from an economic standpoint and for this

reason it is chosen with the two diseases named for a tabular study that will show incidences of the three conditions as found at autopsy.

The occurrence of the three most important diseases in the 322 autopsies:

	Tuber-culosis.	Syphilis.	Malaria.
Negroes.....	81	76	35
Natives.....	13	7	4
Whites.....	3	4	3
Males.....	72	70	30
Females.....	25	17	12
Children.....	15	5	12
Adults.....	82	82	30
Wassermann positive.....		73	.....
Tertiary lues—no Wassermann.....		14	.....

Reference to the list of causes of death will show the relation tuberculosis and syphilis bear to the general incidence of the two diseases.

*Neoplasms.*—In a young and selected population, and in one so largely composed of negroes, the malignant neoplasms are not to be expected in large numbers. However, the present year's record still bears out the belief that cancer is not as infrequent among the negroes as is generally believed. Sarcoma has been found less often than cancer.

*Leprosy.*—No cases have come to autopsy during the year. Several suspects have been examined, as already indicated, and 14 found positive. In the chronic types of this disease showing ulcers of the feet and hands and no skin nodules or nasal lesion, experience has shown that better results toward establishing a diagnosis can be obtained by amputating a digit with an ulcer and subjecting the tissue to an examination at a more remote area than the site of the ulcer.

*Animals.*—The rats have not revealed important findings during the year 1916. The specimens have come from all parts of the zone as well as the terminal cities, but the bulk of them have been catches at the Pacific terminus.

*Hogs.*—Hog cholera still commands attention and is the chief fatal disease appearing among these animals.

*Cattle.*—The presence of southern cattle fever or a disease similar to if not identical with it has been found in calves at the Corozal Hospital farm and in 25 cows and calves at the Miraflores pasture.

*Dogs.*—No cases of rabies have been received at the laboratory.

*Chemical.*—An examination of the *Pistia* plant to determine its value as a source of potassium gave the following results:

Potassium constitutes 8.10 per cent of the mineral matter or ash, which is 57.3 per cent of the moisture-free plant. Of this amount, 3.60 or 44.4 per cent of the entire amount may be extracted by maceration of the plant with water. The process of recovering

the potassium is seriously complicated by the high percentage of mineral matter associated with it. To remove the organic matter sufficiently to permit of the extraction of the potassium requires the use of external heat, which is always costly. However, preliminary experiments have indicated that an electrolytic process might be applied economically without the destruction of organic matter of the plant. This will be the subject of further work.

A consideration of the behavior of petroleum when used as a larvacide led to the study of the methods of modifying the oil so that its spreading power, and therefore its efficiency, might be increased. Tests made on a small scale in the laboratory with a cracking process yielded a product that was thinner in consistency, with a better spreading power, and very much more rapid in its larvicidal action. Efforts to develop the process efficiently on a larger scale without special equipment have not so far been successful.

Twenty-three determinations were made of the fat in the livers of children dying of various diseases. The percentages on the dry basis ranged from 6.35 to 81.98 per cent without the slightest reference to the condition found at autopsy or the age of the child.

*Mosquitoes.*—The mosquito census was continued throughout the year. This consisted of examination and classification of all the mosquitoes taken in the daily hand catch in quarters and barracks at all line stations, military posts, and at Colon and Cristobal, which are mailed to the laboratory after catching. A daily report is mailed to the sanitary inspector in charge of each district and to the surgeon at each post, giving the number and identification of the mosquitoes taken in his district.

From January 1 to December 31, 1916, inclusive, the total number of mosquitoes of all varieties classified was 391,326, as follows:

<i>Anopheles albimanus</i> .....	55,365
<i>Anopheles tarsimaculata</i> .....	3,813
<i>Anopheles argyritarsis</i> .....	4
<i>Anopheles pseudopunctipennis</i> .....	45
<i>Anopheles apicimacula</i> .....	19
<i>Anopheles malefactor</i> .....	114
<i>Mansonia titillans</i> .....	242,957
<i>Mansonia fascioluta</i> .....	265
<i>Mansonia nigricans</i> .....	67
<i>Aedes taeniorhynchus</i> .....	2,154
<i>Aedeomyia squamipennis</i> .....	13
<i>Lutzia allostigma</i> .....	3
<i>Aedes (stegomyia) calopus</i> .....	2,068
<i>Culex</i> and allied genera.....	76,145
<i>Wyeomyia</i> .....	990
<i>Lesticocampa</i> .....	62
<i>Psorophora</i> .....	35
<i>Deinoceritis</i> .....	36
<i>Sabathes</i> .....	1
<i>Joblotia</i> .....	11
<i>Haemagogus</i> .....	3
Damaged <i>Anopheles</i> .....	7,155

The distribution according to districts from which the mosquitoes were collected will appear in the complete report when published.

In March, 1916, our entomologist discovered the breeding places of a type of mosquito with peculiar habits and life history in the Canal Zone. This species of mosquito, known as *Mansonia titillans*, differs from other mosquitoes by passing its entire larval and pupal stage beneath the surface of the water attached to the water lettuce, *Pistia stratiotes*, which is so abundant in the canal near Gamboa, in Gatun Lake, and in several of the rivers emptying into the lake.

Ordinarily mosquito larvæ live free in the water and secure their air supply at the surface of the water, but *Mansonia titillans* have breathing tubes in both the larval and pupal forms so modified as to enable it to pierce the rootlets of the *Pistia* and obtain its supply of oxygen directly from the plants at some distance from the surface of the water. Oil spread over the surface of the water is therefore not a larvacide for this species.

The *Pistia stratiotes* is a rosette of green wedge-shaped leaves. The leaves are broad and flat at the apical end, with a central indentation. The roots are long and filamentous. These plants grow on the surface of the water in large number near the edge of the lake and rivers, where the water is quiet, and they are protected from the winds and currents. They multiply rapidly and soon form large masses. They seem to propagate by seed and also by runners, one plant sometimes having five or six young plants attached to it, each one at the end of a slender rod-like branch or runner.

Strong winds or heavy rains causing an elevation of the water tend to set these masses of plants in motion, and they float about on the surface of the water at the action of the winds or currents until they are swept into protected coves or lodge between the dead trees in the inundated area. The roots of these plants are sometimes several feet in length and hang straight downward in the water. They consist of innumerable filaments and generally have a quantity of decayed vegetable matter and débris attached to them.

It is in this mass of filamentous rootlets that the larvæ and pupæ of *Mansonia titillans* are attached. The larvæ attaches itself to one of the thread-like filaments by puncturing the outer surface with its air tube, which is modified for this purpose. It then inserts the end of the air tube in the puncture and remains attached in this manner. The pupæ performs practically the same process. The roots furnish the larvæ with a plentiful supply of oxygen, and the thickness of the mass serves to protect them from the small fishes.

This manner of living during the immature stages of this species has been known for some time, and it has also been known for several years that the adult mosquito of this species were abundant in the Canal Zone, but the larval and pupal forms had never been found here before. While they are found attached to the roots of the water lettuce, thousands of these plants may be examined without revealing any larvæ, as certain other conditions are also necessary for a favorable breeding place, such as shade, protection from winds and currents, etc.

In pursuance of investigations on this species of mosquito and their habits the entomologist has visited various places in the zone at different times, and has inspected the Mandingo, Chagres, Palenque, Chilibre, Rio Grande, Cano, and Gatun Rivers. No *Pistia* plants were found in either the Rio Grande or Gatun Rivers. Along the edges of the Chagres are numerous small bays and indentations covered with *Pistia* plants, and many of them having *Mansonia* larvæ attached. In lower parts of the Clilibra and Palenque, near their junction with the Chagres, many acres of the plants were found covering the surface of the water, being prevented from floating down the Chagres by being entangled in a mass and by the dead standing timber, fallen trees, and growths of rank grass that serves to bind the plants together by growing up between them. About 5 per cent of the plants in these two rivers were found to have larvæ attached. In the Cano River about  $3\frac{1}{2}$  to 4 miles from the canal the *Pistia* plants were found so thick that in most places the surface of the water was entirely covered with a solid carpet of green plants growing between the dead trees. There were several square miles of masses of these plants found in this region, and about 85 per cent of them were found to be harboring larvæ. The number of larvæ found on the plants examined ranged from 1 to 47. In this river one plant was found with roots over  $3\frac{1}{2}$  feet long floating on the surface, where the water was 27 feet deep, that had 44 larvæ attached to its roots. The Mandingo also has many acres of the plants with many larvæ attached. Besides in the rivers mentioned, plants harboring larvæ were also found at different places along the lake shore and in pools at some distance from the lake.

The largest number of larvæ attached to one plant were found on a plant about 14 inches in diameter taken from the water near the former site of the Bas Obispo station. This had 51 medium and large-sized larvæ attached to its roots.

At present this mosquito greatly outnumbers any other species of mosquitoes found in the Canal Zone. The total number taken during the past year in the daily hand catches in quarters and barracks were 242,957 *Mansonia titillans*, against 148,369 of all other varieties of mosquitoes combined.

Biting experiments were made to determine if *Mansonia titillans* would prove to be a possible factor in the transmission of dengue fever. The one test that was made proved negative. Owing to lack of dengue patients this work could not be carried out as extensively as desired. In connection with this work the entomologist made a number of trips to various places on the Zone to collect larvæ of this species of mosquito. Larvæ of this same species, collected at Bas Obispo, and sent to the laboratory daily from Las Cascadas, were bred out and the adults used for this work.

Observations on the biology of *Dermatobia cyaniventris* were made, with experiments to determine if half-grown larvæ could be successfully transplanted from one animal to another, which proved successful.

Extended observations on the "screw-worm fly," *Cochliomyia desvoidalyi*, have been carried out, and a complete report of this study will be presented later.

A collection is being made of the snakes found in the Canal Zone and vicinity. During the year a total of 43 specimens were received, being obtained through purchase, and by presentation to the laboratory. This number represents a total of 13 genera and 16 separate species. This includes 11 specimens of the "Coral snake," *Elaps fulvius*; 2 of the tropical coral snake, "*Elaps Marmoratus*"; 7 of the "Mapana," *Leptodire albofuscus*; 3 of the "Green tree snake," *Oxybelis fulgidus*; 1 of the "Pike-headed snake," *Oxybelis accuminatus*; 2 of the "Large boa," *Boa imperator*; 1 of the "Common boa," *Boa constrictor*; 3 of the "Rainbow boa," *Epicrates cenchris*; 3 of the "Blunt-headed snake," *Leptognathus catesbyi*; 3 of the "Red snake," *Pseudoboa neuwiedii*; 2 of the "Yellow-bellied sea snake," *Hydrus platures*; 2 of the *Leptocalamus torquatus*; 1 of the *Spilotes pullatus*; 1 of the *Erythrolamprus aesculapii*; 1 of the *Zenoden colubrinus*; and 1 of unidentified "Striped snake."

When sufficient data has been collected it is contemplated to catalogue the snakes of the Canal Zone, with annotations on the appearance and habits of each species and other data that may be obtained.

A number of reptiles, batrachians, and mammals were received at the laboratory during the past year and examined for ectoparasites. These consisted of the 43 snakes mentioned above, 6 toads, *Bufo marinus*; 2 large iguanas, *Iguana tuberculata*; 1 large lizard, *Cnemidophorus* sp.; 1 nine-banded armadillo, *Tatu novemcinctum*; 1 Batty's opossum, *Didelphys marsupialis battyi*, and 1 Earl of Derby's opossum, *Caluromys derbianus*. The iguana ticks, *Amblyomma dissimile*, in various stages of development, were found on about 70 per cent of the snakes, on 90 per cent of the toads, and on both the iguanas. The remainder of the collection were free from ectoparasites.

Observations are being made on the development of the floating water lettuce, *Pistia stratiotes*, to determine the rapidity of growth with a view of discovering facts of possible value in the wholesale destruction of this plant, if this should be undertaken in the future to eliminate the breeding of *Mansonia titillans*.

Collections of mosquito larvae were secured at the laboratory whenever possible from all available sources. These were bred out, and specimens of the larvæ, pupæ, and adult mosquitoes preserved for the collection. This work is being carried out with a view of determining the different species of mosquitoes to be found in the Canal Zone. A good-sized collection has been secured up to date, and undoubtedly the coming dry season will yield more new species. An annotated list of the different species will be put out at a later date.

#### COLON HOSPITAL.

The routine work was carried on in the old hospital buildings until May 15, 1916. Since May 16, 1916, the new hospital has been occupied. All of the old hospital buildings proper have been torn down and removed except the morgue, chapel, stable, one old storehouse, old ward A, operating pavilion, and the nurses' section of the old hospital buildings, which is still occupied by the nurses

as their home. Estimates have been submitted for a new nurses' home, which it is expected will be built the present year.

The new concrete hospital and storehouse have, after eight months' trial, been found very satisfactory.

The quarters for silver married employees have been moved and are now placed along Second Street. House No. 324, now occupied by doctors and druggists of the hospital and quarantine employees, has also been placed along Second Street in line with the silver married quarters. The new four-family concrete house for use of doctors is rapidly nearing completion. It should be ready for occupancy in less than a month.

Work is expected to begin soon on the new concrete garage and morgue.

The auto ambulance has been in operation for several weeks and is rendering excellent service.

The professional work of this hospital has been carried on at a high standard. The work is particularly exacting for physicians and nurses on account of the large amount of emergency surgery, which requires attention at irregular hours.

Detailed statistics are shown in Tables VII, XIII, and XV.

#### PALO SECO LEPER ASYLUM.

A new one story building, 28 by 72 feet, containing six rooms, each 12 by 16 feet, with bathroom and toilets and front and rear porches, was completed during the year. All work with the exception of the installing of electric lights and plumbing was done with patient labor under the supervision of the superintendent. Another building of the same dimensions containing six rooms, two bathrooms, and two toilets was at the close of the year about 50 per cent completed. The buildings will be used as quarters for male patients and will relieve the present congested condition.

Male patients formerly living in building No. 12 on the hill to the west of the hospital grounds proper have been transferred to the new building, and building No. 12 will be repaired and painted and used as quarters for the male employees.

Building No. 5 was dismantled during the year by patient labor and rebuilt on a new site to the west of the hospital grounds proper.

Telephone connection with Balboa exchange was completed during the year, which greatly facilitates the transaction of business.

The water supply for the asylum, which came from a well within the hospital grounds, began to fail to furnish the required supply about the middle of July. It was decided to sink another well farther back on higher elevation. Work was completed by the municipal engineers in September, and an ample supply of good water was found at the depth of 147 feet. Installation of the pump and connections was completed the latter part of December.

Due to the severe force of the surf on the southwest end of the beach, the tile sewer line was broken during the year, necessitating a new line of 8-inch wrought iron, extending 960 feet from the end of the old line, running to the southwest of the asylum and terminating beyond the last reef, which was installed by the municipal

engineering department. One hundred and thirty-eight feet of tile sewer was laid, connecting buildings Nos. 5 and 12 with the main line.

A dinghy type boat, 18 feet long, and two Evinrude motors were purchased and put in use carrying supplies to and from Balboa, eliminating the great expense of launch service.

A new survey of the reservation was made during the year by the fortification department, and a portion of the reservation to the west of the asylum proper, next to the cemetery, was turned over to that department.

During the year there were 17 admissions and 9 deaths, with 66 patients remaining in the institution at the end of the year. The average number of patients constantly cared for during the year was 62.81.

At the close of the year 49, or 74 per cent of the patients, are taking chaulmoogra oil. Marked improvement in a number of cases is shown and accurate records of the results of the treatment are being kept.

Motion-picture shows were given weekly during the year, the reels being furnished the asylum by the bureau of clubhouses and playgrounds. At these entertainments ice cream and cake are served to the patients.

#### SANTO TOMAS HOSPITAL.

The number of patients treated in hospital was approximately 500 less than for the preceding year, the actual figures 11,282 for 1916 as against 11,778 for 1915. The hospital is taxed to the limit of its accommodations at all times. Very creditable work is being done in all departments.

The necessity for a separate hospital for tuberculosis patients was commented on in the last calendar year report. The matter was taken up with the Panama Government, but due to lack of funds nothing was accomplished. The Panama Government has now agreed to reconstruct certain old buildings in the hospital grounds, which will increase the total bed capacity and provide an open-air roof ward for tubercular patients and better wards for isolation of contagious diseases. This will relieve the immediate situation but a separate institution for tubercular patients is the only satisfactory solution of the overcrowding problem of this hospital.

Detailed statistics are shown in Table VII.

#### DISTRICT DISPENSARIES.

Five line dispensaries have been maintained throughout the year.

The stations having the highest admission rates for malaria were Gatun and Cristobal, with an average weekly percentage of 0.21 and 0.06, and the lowest, Ancon and Paraiso, with 0.03 each.

## ZONE SANITATION.

The division of zone sanitation has directed its energies during 1916 along the usual lines, namely, the prevention of mosquito breeding, the maintenance of sanitary conditions throughout our towns, the elimination of flies, the extermination of rats, etc. Since malaria has been the chief factor in the constantly noneffective rate for the zone from time immemorial, and because it is best limited by measures directed toward the suppression of malaria-bearing mosquitoes, a very large proportion of the men employed and the money expended by this division have been for the purpose of controlling the malaria situation. During the days of construction, the difficulties incident to absolute control of the malaria situation were insurmountable. During recent years the activities of employees have been constantly becoming more circumscribed and confined to definite localities in which conditions can be more fully brought under control than formerly. The results of the work done under recent conditions are most encouraging, the admission rate for malaria and the constantly noneffective rate due to malaria for 1916 being, roughly, one-third of the corresponding rates for the preceding year. Estimating the saving to the Panama Canal incident to this reduction in the malaria rate on a conservative basis, we find that it means approximately \$20,000 over that of the previous year.

## SANITATION—PANAMA.

*Malaria.*—The year just passed has been the best from an anti-malarial standpoint that we have had since the opening of the canal work, which is reflected in the extremely small number of deaths, and in the small number of hospital admissions from this disease.

Only nine deaths were recorded during the entire year from malarial fevers, and during the last dry season, for the week ending February 26, 1916, only four hospital cases of malaria were reported, of which three were clinical. This is the low-water mark in the history of Panama to date.

Again in May, a new malaria rate record was established for the 15,000 employees living in Panama city. There were no reported hospital admissions on account of malarial fever from among the employees, giving us a perfect score for the month.

During 1916, it may be noted that we have had an average of slightly more than one admission per week from employees living in Panama city. In view of the fact that these employees are living in unscreened houses (the houses rented them by the property owners of Panama not being provided with screens) it would seem that the minimum admission rate for this disease has been reached for such a number of persons living under such circumstances.

The drainage system which encircles Panama city has more than 150,000 feet of earth ditches of various sizes from 6 inches in width to 8 feet wide, depending on the area drained. To maintain this work requires money, energy, and experience, yet without this

work the malaria status of the city would soon assume the frightfulness of former days.

A survey was made of the outlying districts in which we carry on antimosquito work for the purpose of locating houses in which there were to be found cases of malarial infection. Ten such houses were located, and quinine, both in capsule and liquid form, was left with careful instructions to the occupants as to its use. These people, who are of the poorer class of Panamans, present marked anemia due to hookworm infection and chronic malaria, and are potent factors in providing the community with malaria-infected mosquitoes.

The case incidence for the entire city of Panama has been reduced from 179.5 per month in 1914, and 51.1 in 1915, to 19.6 in 1916.

*Tuberculosis.*—No improvement has been noted in the prevalence of this disease in the city, and a gradual increase in the number of deaths from the pulmonary type, as well as all other forms, is noted from year to year.

The total of deaths reported for the three years past is as follows:

Year.	Pulmonary tuberculosis.	Other forms.	Total.
1914.....	206	23	229
1915.....	210	35	245
1916.....	242	71	313

The death rate from tuberculosis in all its various forms for the year 1916 is 5.15 per 1,000 population, which is considerably in excess of the rate of 1.46 per 1,000 for the year 1915 in the registration area of the United States.

*Pneumonia.*—In 1916 there were 209 deaths from pneumonia, including broncho-pneumonia; giving a death rate per 1,000 population of 3.44, as compared with 1.33 for the registration area of the United States in 1915.

The years 1914, 1915, and 1916 show marked increases over the preceding years as a result of the rapid increase in population of Panama city from the closing down of the Canal Zone work and consequent depopulation of the towns along the line, their residents all flocking to the cities of Panama and Colon. Of this increase, Panama received the larger share. This has resulted in overcrowding of quarters as indicated in last year's census, where it was shown that there was not less than three persons per room on an average throughout the city, and while the rooms are adequately ventilated for ordinary purposes, with such overcrowding, the number of cubic feet of air space per hour per person is necessarily low.

*Typhoid fever.*—During the year 1916, there were 19 cases of typhoid fever reported from the city, 3 of which terminated fatally. This does not include six cases which were reported as clinical forms of this disease. This gives a death rate of 0.05 per

1,000 population as compared with 0.12 for the registration area of the United States for 1915.

*Diphtheria.*—During the year there were 57 cases of this disease in the city, with 6 deaths. This gives a rate of 0.10 per 1,000 population, as compared with 0.16 in the registration area of the United States for 1915. Beginning with the latter part of July, there was a slight increase in the incidence of this disease which continued throughout September, but was well controlled by effective isolation methods, early administration of antitoxin, the holding of patients in quarantine until negative cultures were obtained, and a search for and isolation of bacillus carriers from the infected households.

As a result of this active campaign, there was only one case of this disease reported to the health office in December.

*Diarrhea and enteritis* (under 2 years of age).—The rate of deaths per 1,000 population in the registration area of the United States in 1915 was 0.72, as compared with the following rates in Panama City: 1914, 4.99; 1915, 5.10; and 1916, 4.59 per 1,000 population.

*Vaccination.*—The requirement that children present satisfactory evidence of recent successful vaccination before being admitted to the schools of the city was successfully enforced, and a number of the younger children who had not been vaccinated in previous years were vaccinated prior to being admitted to the schools.

An arrangement was made with the department of public instruction of the Republic of Panama whereby a record is kept in all schools of those children vaccinated, and whether successfully or not. It is believed that this will prove of great value in the future.

A total of 1,949 vaccinations were performed by the health office during the year, which included a large number of vaccinations of adults in the district where the cases of smallpox were reported in November.

*Bureau of infant hygiene.*—This work was started during the month of November, one trained nurse being assigned to the bureau. Her time is divided between clinic work in the hospital and making outside visits to the children in their homes, making inspections as to conditions, giving instructions as to the proper care of the babies, etc.

It is too early to make any very definite reports of this work, but it is believed that by the expiration of the present year a very favorable report of work accomplished can be shown.

The station for this work has been established at Santo Tomas Hospital, at which place the nurse in charge takes histories of children, especially of those born in the institution, examines and weighs them, and makes proper records as to their progress.

*Midwives.*—The ordinance requiring the registration of midwives was put into effect during the year, and they are now under the supervision of this office. Their applications for registration in the health office must be accompanied by certificates from two registered physicians and a responsible layman. One requirement for certification is that a midwife must have attended no less than 20 cases of labor under the supervision of a responsible physician.

Upon receipt of an application for registration of a midwife, an inspection is made of her premises and equipment, and an examination is given her by the health officer to determine her fitness for the practice of her profession.

The Panama Government has established a school for midwives in the maternity wards of Santo Tomas Hospital, under the direction of the national board of hygiene of Panama, and practicing midwives who hold a diploma from that school are registered in the health office without further examination.

#### GENERAL SANITATION.

The routine work of this class was carried on throughout the year as effectively and with as little expense as possible. The number of districts in which the city is divided for this class of work remains the same, i. e., four, each in charge of an experienced sanitary inspector, with a small gang of laborers, and for the largest district the inspector is assisted by a competent foreman. The work consists of routine house and patio inspections, in search of the breeding of domestic mosquitoes, the abatement and prevention of nuisances of all kinds, cooperating with the building inspector in seeing that all repairs or construction of buildings in their districts is carried on strictly in accordance with the building regulations, particular attention being paid to rat-proofing features.

*Stables.*—The extensions to the Panama Railroad stables were completed, and this has provided much needed stall space, making it possible to close up any dirty or ill-kept stables which have not complied with the sanitary regulations governing such establishments, although they have had more than two years' time in which to comply with these regulations.

The new stables pay particular attention to the rat-proofing features, and every care is taken to avoid any fly propagation.

*Disposal of manure.*—The sanitary regulations provide that all manure from each stable shall be removed at least once in 24 hours, and disposed of as may be indicated by the health officer. It is further provided that when being carried away it shall be done in wagons so protected as to render it inaccessible to flies.

This manure is carried to the public open-air dumps and there stored in large piles or mounds, approximating 10 by 20 by 6 feet high. The manure is then covered with rubbish, such as paper, shavings, light wood refuse, and other inflammable materials and then ignited.

A thorough charring of the outer surface of the mounds results, the ash of which is very unattractive to adult flies; therefore it is very rare to find any further deposits of eggs or larval development. After standing for five or six weeks, depending on temperature and rainfall, this mound decomposes into a compost, which may then be used for garden fertilizer without liability of the further breeding of flies.

This method of manure treatment to prevent the breeding of flies and at the same time have the manure available for garden fertilizer is considered very efficient and extremely economical, and would doubtless be suitable for many small cities which are unable to dis-

pose of their manure completely through incineration. The revenue to be derived from the sale of the compost would offset the expense of the treatment.

*Milk and dairies.*—Below is a recapitulation of the work performed along this line, from which will be noted that there is a considerable increase in the number of cows reported in the various dairies. This is largely due to the fact that a large number of small dairies, some distance from the city, which were not formerly inspected, have now been included in the work of this division. This has lowered the average rating of the dairies inspected, as the most of these small "bush" dairies consist of a hut in the jungle with one or two cows grazing nearby, the milk of which is handled in the most crude manner.

An endeavor has been made to have a few of the better class of dairies owned by Panamans put in the best sanitary condition, so they may stand as models to other local dairies which have not attained so high a standard.

Advantage has been taken of the dairy at the Corozal farm in the Canal Zone to use that as a model for all the local dairies with very good results.

Dairies licensed.....	56
Milk vendors licensed.....	69
Dairies closed by health department.....	16
Dairies closed by owners.....	7
New dairies constructed.....	12
Plans approved for new dairies.....	18
Cows:	
1914.....	545
1915.....	749
1916.....	1,110
Daily output of milk:	
1914.....	gallons.. 312
1915.....	do..... 617
1916.....	do..... 827
Average dairy score:	
1914.....	69.71
1915.....	68.20
1916.....	61.47

*Bakeries, bottling works, candy kitchens, hotels, restaurants, etc.*—Regular routine inspections are made of establishments of this class by the food inspector, and the sanitary regulations affecting them are being enforced, resulting in marked improvement in nearly all such places.

Several of the leading bakeries in the city will now compare very favorably over former years, some of them having been practically rebuilt and a marked improvement in their general condition obtained.

The regulation of miscellaneous food peddlers is being enforced and a list kept in the office of all such persons to whom permits have been issued. Their wares offered to the public are required to be covered so as to be protected from flies and dust, and it is hoped that this precaution will, in a measure, safeguard the health of the patrons of these dealers.

Below is a recapitulation of the work performed during the year.

*General food inspections.*

Month.	Dairies, milk vendors, etc.	Bakeries, candy kitchens, etc.	Bottling works.	Hotels, clubs, restau- rants.	Miscel- laneous.
January.....	94	5	3	49	25
February.....	145	36	.....	22	31
March.....	35	2	.....	6	12
April.....	187	5	3	1	71
May.....	89	13	8	1	39
June.....	78	117	1	9	84
July.....	21	53	4	49	40
August.....	48	47	9	1	34
September.....	48	12	6	98	206
October.....	7	26	34	12	108
November.....	16	124	3	6	71
December.....	60	23	12	.....	43
Total.....	826	463	83	254	764

All meat slaughtered locally is subject to inspection and action of the city veterinarian, a Panamanian official. The services of this office have been at his disposal when desired.

*Building inspection—Construction and repair.*—There has been a general increase in activity in this line of work throughout the entire city, the prevailing type of building being of frame construction.

Considerable improvement is noted in the type of tenement house, particularly as to light and ventilation, and the floor space of the rooms. Property owners find that it is advantageous to have large, airy, well-lighted rooms in order to retain their tenants.

As already mentioned, the district inspectors cooperate with the building inspector, a total average of about 1,000 inspections per week being made by all of the inspectors engaged in this work.

Particular attention is paid to the rat-proofing features provided for in the building regulations, great stress being laid on the proper construction and repair of roofs and ceilings, in which considerable amount of rat harboring was encountered. Many old buildings have been remodeled or repaired in order to comply with these requirements.

*Sanitary nuisances abated.*—A total of 4,495 nuisances were abated during the year by the inspectors. These consisted principally of defects in plumbing, floors, pavements, etc., noted by the district inspectors in their daily rounds. The notices were served by them, and the work checked up by them subsequently.

During the year it was necessary to clean 56 properties for private parties, the work being performed for them at their expense.

In connection with this work it was necessary to impose 121 fines on delinquents for various causes, the total amount imposed being \$905, less two fines of \$25 that were remitted.

*Street cleaning and sprinkling.*—The city is now divided into three districts for the facilitation of this work, each district being in charge of a foreman and gang of push-cart street sweepers. At

present the entire city is cleaned through what is known as the "picket system," which is found to be the most efficient and economical.

In general, each sweeper is assigned a definite street area and his foreman holds him responsible for the cleanliness of his area. By frequent inspections on the part of the foremen, as well as the inspector in charge of that branch of the work, the street sweepers are kept up to the mark in their work, and their sections are kept fairly clean at all times.

With the installation of a large number of macadam-asphalt streets by the municipal engineering division during the past year, the work of street cleaning and sprinkling has been much facilitated, as this type of street in the Tropics is very much easier to clean, requires less sprinkling to keep down dust, and does not afford anything like as many nuisances as the old type of macadam street.

*Garbage collection and disposal.*—This service has been carried on as efficiently and economically as possible during the year. The entire work is now done during the day, whereas formerly it was partly done at night and partly during the day, thus requiring extra gangs and foremen on account of the division of the work.

The collection is begun in the early morning hours at a point farthest; from the dump, working always in collecting toward the dump; thus as the day advances the haul becomes less each trip.

The service has been extended to include the exposition grounds, which adds a good deal to the territory covered by this work.

The present means of disposal is open-air burning, which is as effective as it is possible to be for a climate of torrential rains. The garbage is piled in long windrows, which favors the quick running off of water after the heavy rains and also allows more wind action on the fires, preventing their extinction as much as formerly.

Considerable filling has been accomplished with refuse, ashes, etc., from the dumps, and some very bad swampy areas have been eliminated near by.

A modern incinerating plant is being constructed for the incineration of all garbage produced in Panama and the terminal Zone towns on the Pacific side. The erection of this plant will fill a long-felt want and aid in the elimination of many grave nuisances which are encountered at the present dump.

During the year a total of 891 garbage cans and pails were sold to the residents of Panama, covers being provided for them by this office.

#### SANITATION—COLON.

The present organization of the health office, Colon-Cristobal, remains the same as last year. One sanitary inspector each is assigned to four districts; one has charge of the street-cleaning and garbage collection, and one of the food inspection, restaurants, hotels, etc.

In each of the four districts the inspector has a small gang of laborers under him who eliminate mosquito-breeding places and all rubbish, clean premises, go through and examine every house at least twice a week.

*Mosquito control.*—The elimination of mosquito breeding in Colon and Cristobal has been so thoroughly done that the end of the year saw the complete cessation of it, and the malarial rate is the lowest in the history of the Isthmus. The dry filling of the swamp in East Colon for the purpose of erecting new gold quarters there and the new storm sewer on G Street will practically end all danger of mosquito breeding there when the work is completed.

In Mount Hope district, where breeding has always been considerable and a source of danger to the whole Atlantic terminal, extensive work of a permanent nature has gone on this year with marked results. Large areas of swampy land have been filled both by dry and hydraulic filling, and others drained.

One of the results of this has been that the highest malarial rate for 1916 was two-thirds lower than that of 1915; while the rate in 1916 touched zero and remained there for some time, five times as often as in 1915.

*School inspection.*—The schools in the district are periodically inspected, the dispensary staff making the annual physical examination of all pupils in the Zone schools, and the health office conducting monthly inspections both of public and private schools.

All children not protected against smallpox were vaccinated, and no epidemic has interfered with the work of the schools in the current year.

The health office has enjoyed the hearty cooperation of the teaching staff, which has been of special value in reporting notifiable diseases.

*Food inspection.*—The work of food inspection has been maintained and conditions have been improved. A new concrete hotel in Cristobal is nearing completion, whose construction was undertaken largely at the initiative of the health office and because the old building had become eminently unsatisfactory.

Three new concrete hotels have been opened in Colon and others renovated and improved.

The milk supply of the city is regularly inspected, and no cases of disease have been traced to that source.

The health department has been active in getting rid of a threatened invasion of anthrax here and has secured a thorough system of inspection to prevent the sale of infected meat.

Standard-type fowl coops are in use in Colon, and no small animals for slaughter are allowed in private premises.

All bakers are subject to physical examination and must have licenses. All bakeries have been renovated and improved notably.

The pure-food work will be facilitated by the contemplated concentration of the native trade at one place on Folks River in East Colon, where a concrete pier has been erected by the Panama Railroad for their use, with a view of controlling the entrance of food products through this channel.

*Nuisances.*—The rebuilding of the large burned area of Colon in concrete structures has tended greatly to reduce fly and rat infestation.

Flies have been reduced to a minimum, due largely to the use of new manure-curing pits and to the strict enforcement of the rules for the segregation of horses and other animals.

The demolition of a number of old buildings along the water front and the filling in of holes in the coral rocks drove the rats into the city where they are caught in traps, two men being detailed for this work all of the time. As many as 31 rats have been caught in one day by one man.

In abating nuisances around premises and in the enforcement of the sanitary laws the police departments both of the Canal Zone and municipality of Colon have cooperated with the health office in a very satisfactory manner. In Colon there have been special details of policemen with the sanitary inspectors with good results.

*Garbage and rubbish collection.*—This work has gone on as in previous years, except that increased rapidity of collection has been noted as a result of the districting of the city and the shorter periods of routine inspection.

The use of the new concrete and metal stands has resulted in improved conditions and they are now installed in a majority of cases, the old wooden ones being retired as fast as they can be condemned.

A barge for garbage collection and dumping into the sea of the garbage from the docks is being built and will soon be in commission.

*Street cleaning.*—This is effected as formerly by hand labor. Some of the most used streets have been oiled to keep down the dust in the dry months.

The macadam is being replaced with concrete on Bolivar Street and adjoining side streets, which will facilitate the street cleaning and permit of the use of street sweepers, an improvement over the present system.

*Municipal engineer changes.*—The main sewer from Colon was changed to empty into the bay instead of Folks River, this change being on account of the building of a residential section on Folks River beach. A new pumping station and sump is being built near this new residential site.

A large storm sewer is being constructed along G Street to run from Ninth Street to the beach in front of Colon Hospital. The sewer system at Battery Morgan was extended and consolidated, owing to the building of military barracks there.

In general the rebuilding of Colon since the two recent fires is resulting in vastly improved conditions affecting the general health and appearance of the city.

#### QUARANTINE DIVISION.

A résumé of the quarantine operations for the year 1916 shows that the activities of this division were concerned, as usual, with the safeguarding of the Isthmus against the introduction of quarantinable disease. During the time of the prevalence of infantile paralysis in the States very careful inspection of incoming passengers was made, and in the cases of all under the age of 16 showing an elevation of temperature measures of isolation were carried out until the cause was determined. In addition to the functions of quarantine, the conduct of immigration has required close attention

on the part of the quarantine division, particularly since the passenger boats engaged in the west coast traffic have made Cristobal their terminal port, thereby centering the immigration work to a very large extent on the Atlantic side. The matter of preventing the landing of undesirables on the Isthmus has been carried out to a very successful degree, and our ports are at the present time freer of roustabouts and undesirables than probably at any time previous.

Along the first part of the year the yellow-fever situation on the west coast of Colombia, in Buenaventura and vicinity, was still looked on with some apprehension, due to the outbreak of this disease occurring in the latter part of 1915. The sanitary measures, however, carried out by the commission from the Canal Zone, have evidently had good results, and no cases have been reported from this locality for some time. It has, however, been considered necessary to maintain protective quarantine against all Colombian ports. On the Atlantic side yellow fever has been reported on the islands of Barbados and Martinique; because of the fact, however, that ships rarely reach the Isthmus from these ports under six days, the matter has caused us no great concern.

Bubonic plague has shown no decrease in its distribution in South America during the year of this report, but on the contrary has probably extended to localities previously considered noninfected or at most only in the suspicious class. One marked increase of this disease occurred in the vicinity of Paita, Peru, and an extension of the disease northward from Guayaquil, Ecuador, has taken place, involving the country districts in the vicinity of Manta and Bahia, Ecuador; these ports are a relatively short distance below the Colombian border and the prevalence of plague in these vicinities can only mean an extension of the disease northward and closer toward zone ports. In view of the fact that plague is so generally distributed, along the west coast of South America particularly, we have endeavored to tighten and improve our antiplague measures with reference to the ships in zone ports. Our local measures of breasting off, rat guarding, raising of gangways at night, fumigation, etc., have been watched very closely because the potential danger to the zone from the standpoint of rat introduction is much greater than through the agencies of human transmission. To this end mechanical cleanliness and improved sanitary conditions aboard ship have received careful attention, and the value of all these measures emphasized to the local shipping interests.

General measures toward the improvement of our quarantine grounds and buildings have been given attention, and at the present time the two quarantine stations are in a state of fairly good equipment.

The inspection of cattle, both quarantine and ante and post mortem, has required very careful attention, due to the occurrence of anthrax at the end of the last dry season. Cases of this disease occurred among the cattle pastured near Colon in February, March, April, and to some extent a little later. The experience in 1914 and 1915 with reference to anthrax led us to expect a recurrence of this disease before the dry season was over. Further deaths from anthrax also occurred during the month of November, due, in all

probability, to overcrowding of infected pastures. The measures, however, outlined by the health department in the campaign directed against anthrax have resulted in the absence of new cases of this disease among cattle on the zone and has been due largely to extension of pasture lands in noninfected territory, care in the matter of prevention of overcrowding of old pastures which are considered infected, placing of vaccinated cattle only on old infected areas, and the reduction of the total number of cattle pastured on the zone. A most careful method of procedure was carried out with regard to ante and post mortem inspection, and it is believed that cattle taken for slaughter are safeguarded in this respect to a most careful degreee.

During the year the following ante and post mortem inspections were made by the veterinarians of the health department for the supply department: Cattle, 10,241; hogs, 20; sheep, 2. For outside interests: Hogs, 13. Quarantine inspections were made as follows: For the supply department 12,215 cattle, 20 hogs; for outside interests 1,048 cattle, 603 hogs.

## ADMISSION RATE PER 1,000 EMPLOYEES.

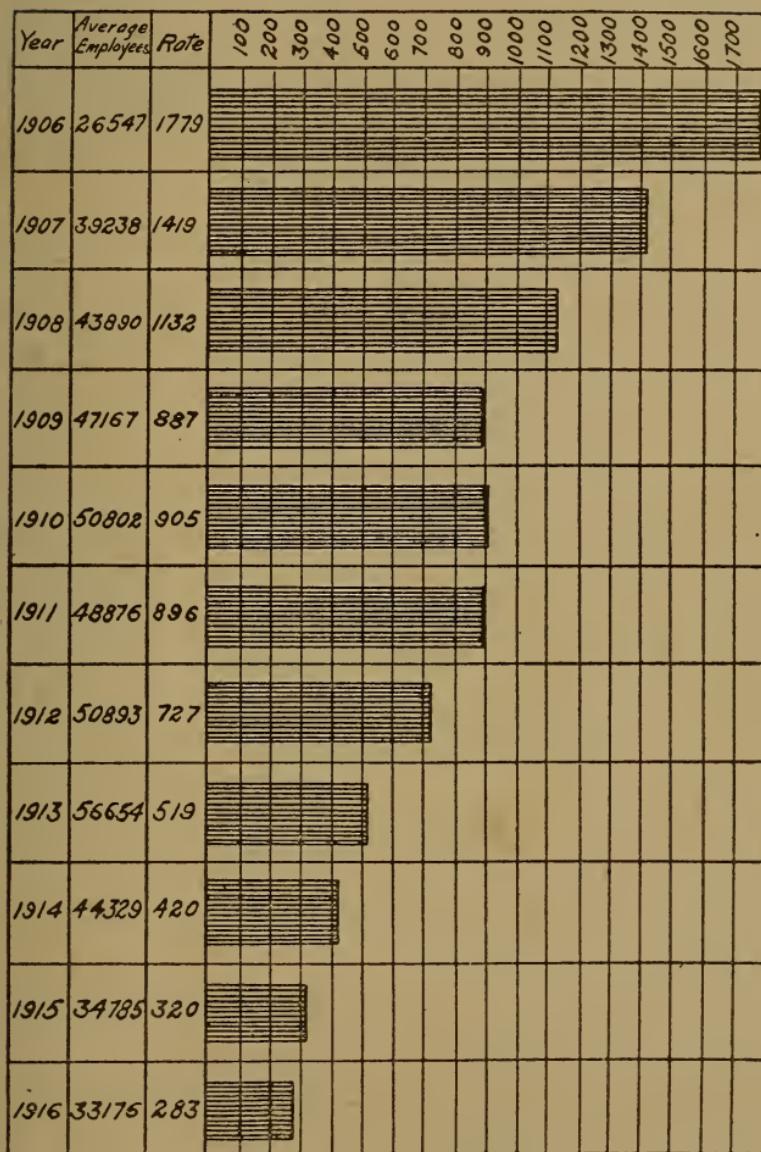


CHART NO. I.

## DEATH RATE PER 1000 EMPLOYEES.

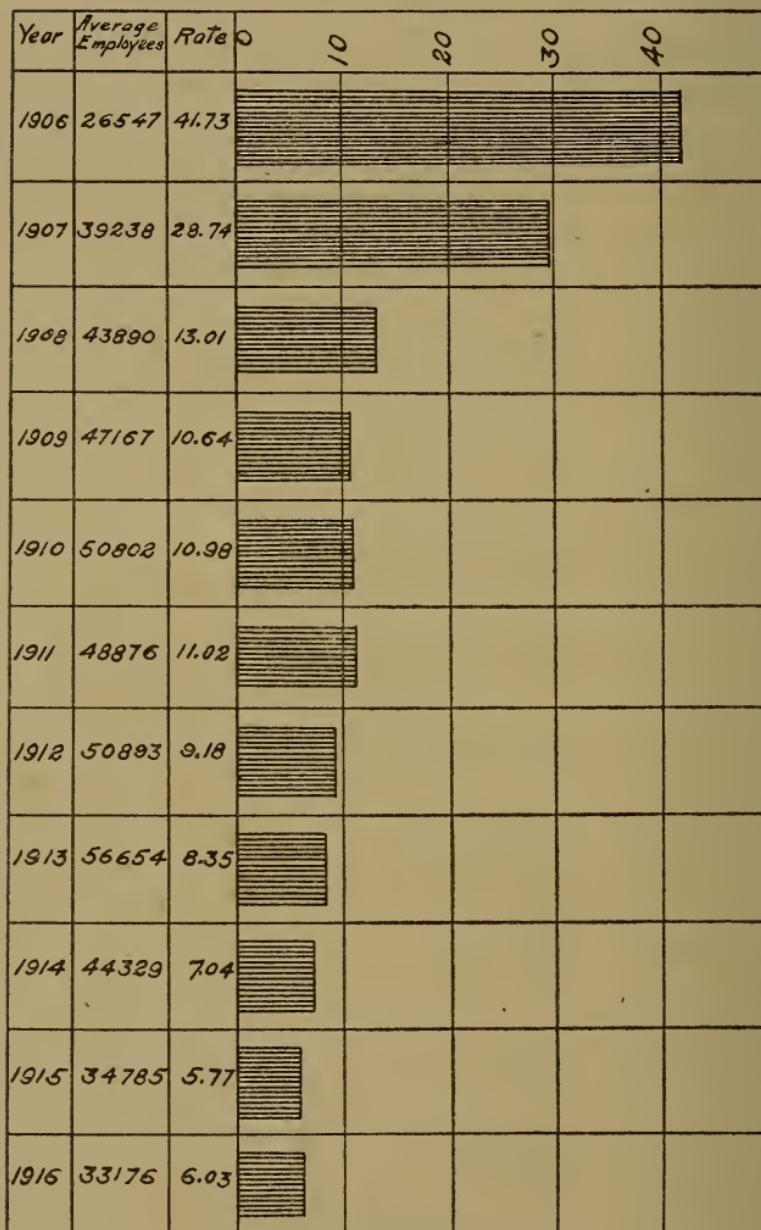


CHART NO. II.

## NONEFFECTIVE RATE PER 1,000 EMPLOYEES.

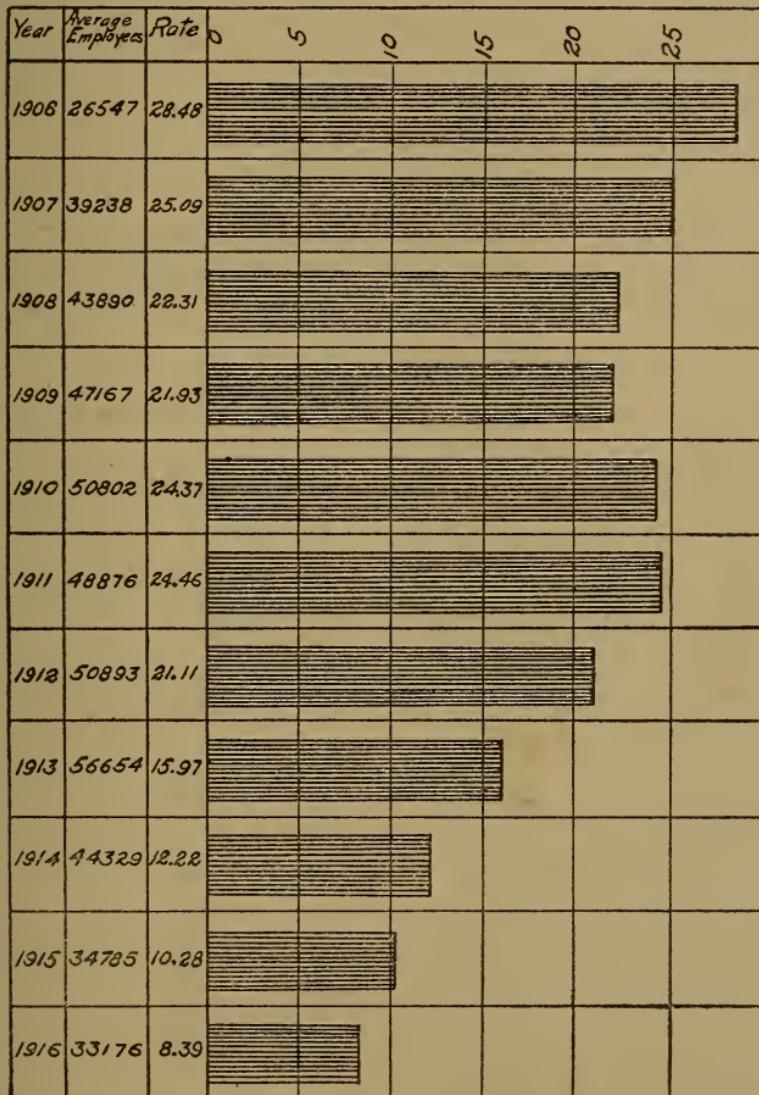
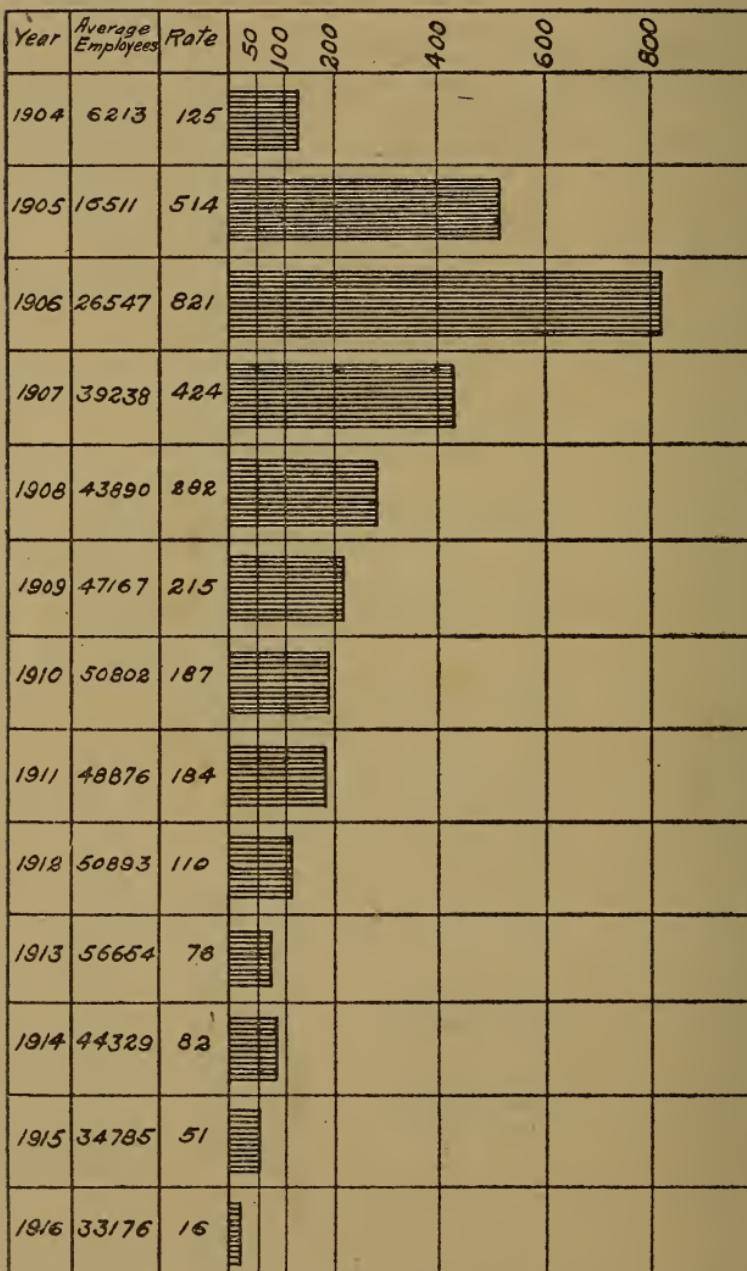


CHART NO. III.

**MALARIAL FEVER**  
**ADMISSION RATE PER 1,000 EMPLOYEES**



**MALARIAL FEVER**  
**DEATH RATE PER 1,000 EMPLOYEES**

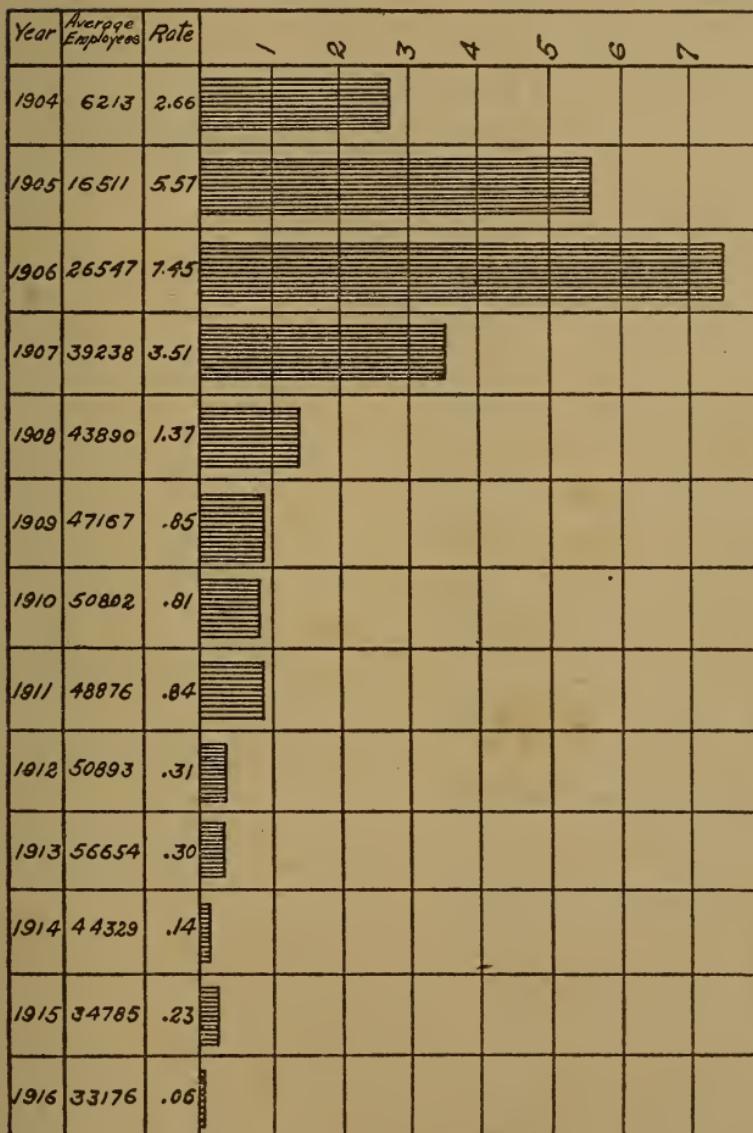


CHART NO. V.

**MALARIAL FEVER**  
**DEATH RATE PER,1,000 POPULATION IN THE**  
**CANAL ZONE AND THE CITIES OF PANAMA AND COLON**  
**EMPLOYEES AND NONEMPLOYEES.**

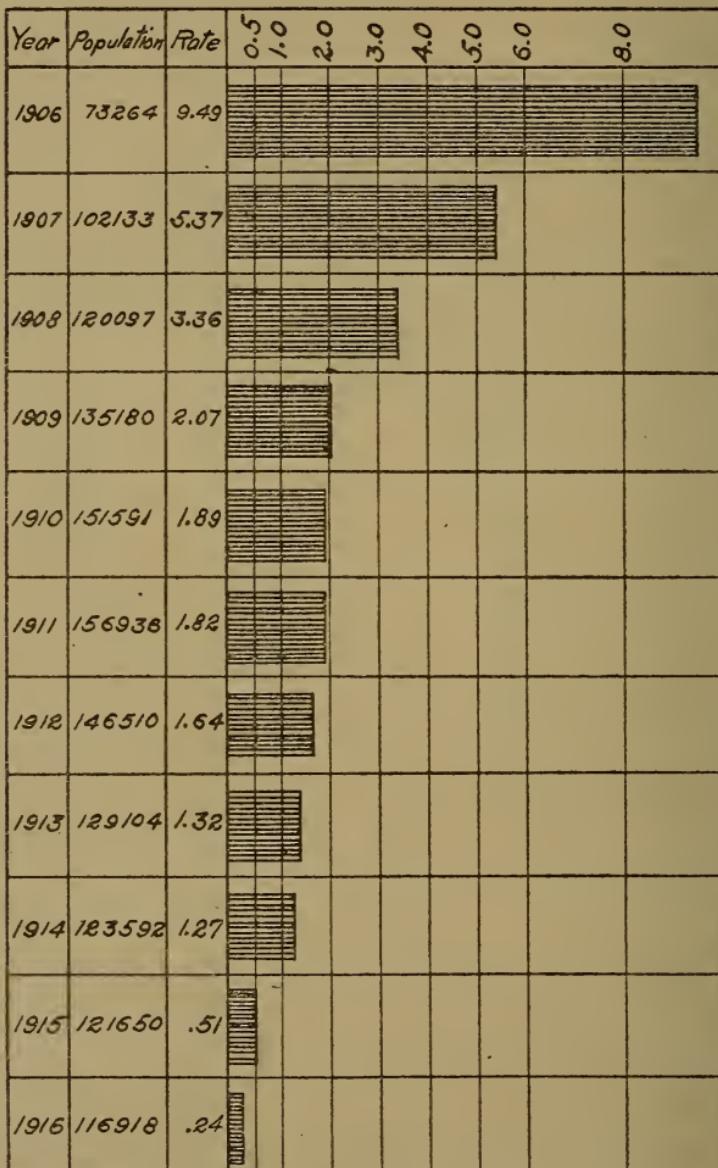


CHART NO. VI.

TABLE I.—ADMISSIONS, DEATHS, AND NONEFFECTIVE RATES FOR EMPLOYEES.

## ABSOLUTE NUMBERS.

Color.	Av- erage num- ber of em- ploy- ees.	Admissions to hospitals.			Deaths.			Noneffective from sickness. <sup>1</sup>	
		To- tal.	Dis- ease.	Exter- nal causes.	To- tal.	Dis- ease.	Exter- nal causes.	Days treat- ed.	Con- stantly nonef- fective.
<b>Year 1916:</b>									
White.....	4,552	1,473	1,217	256	24	15	9	29,513	80.86
Colored....	28,624	3,186	2,224	962	176	137	39	82,116	224.36
Total....	33,176	4,659	3,441	1,218	200	152	48	111,629	305.22
<b>Year 1915:</b>									
White.....	4,719	1,868	1,572	296	26	15	11	34,123	93.49
Colored....	30,066	4,608	3,431	1,177	175	126	49	96,400	264.11
Total....	34,785	6,476	5,003	1,473	201	141	60	130,523	357.60

PROPORTIONATE NUMBERS.<sup>2</sup>

<b>Year 1916:</b>									
White.....	4,552	323.59	267.35	56.23	5.27	3.29	1.98	.....	17.76
Colored....	28,624	111.31	77.70	33.61	6.15	4.79	1.36	.....	7.84
Total....	33,176	140.43	103.72	36.71	6.03	4.58	1.45	.....	9.20
<b>Year 1915:</b>									
White.....	4,719	395.85	333.12	62.73	5.51	3.18	2.33	.....	19.81
Colored....	30,066	153.26	114.11	39.15	5.82	4.19	1.63	.....	8.78
Total....	34,785	186.17	143.82	42.35	5.77	4.05	1.72	.....	10.28

<sup>1</sup> Includes both hospitals and quarters.<sup>2</sup> Annual average per 1,000.

## DEATHS OF RESIDENTS OF THE CITIES OF PANAMA, COLON, AND THE CANAL ZONE.

Place.	Average population.	Deaths.			Annual average per 1,000.		
		Total.	Disease.	External causes.	Total.	Disease.	External causes.
<b>Year 1916:</b>							
Panama.....	60,778	1,765	1,702	63	29.04	28.00	1.04
Colon.....	24,693	696	662	34	28.19	26.81	1.38
Canal Zone.....	31,447	343	290	53	10.91	9.22	1.69
Total.....	116,918	2,804	2,654	150	23.98	22.70	1.28
<b>Year 1915:</b>							
Panama.....	60,373	1,810	1,749	61	29.98	28.97	1.01
Colon.....	29,331	640	604	36	21.82	20.59	1.23
Canal Zone.....	31,946	410	361	49	12.83	11.30	1.53
Total.....	121,650	2,860	2,714	146	23.51	22.31	1.20

TABLE II.—DEATHS BY AGE, COLOR, AND SEX.

	White.			Colored.			Yellow.			Total.		
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.
Under 1 year....	55	28	83	436	368	804	5	6	11	496	402	898
1 to 4 years....	15	16	31	189	148	337	1	3	4	205	167	372
5 to 10 years....	4	6	10	24	19	43	1	1	2	29	26	55
11 to 20 years....	4	5	9	43	52	95	.....	1	1	47	58	105
21 to 30 years....	38	14	52	252	174	426	5	1	6	295	189	484
31 to 40 years....	44	11	55	191	132	323	10	.....	10	245	143	388
41 to 50 years....	23	10	33	123	69	192	10	.....	10	156	79	235
51 to 60 years....	22	4	26	73	41	114	5	.....	5	100	45	145
61 to 70 years....	16	4	20	24	19	43	3	1	4	43	24	67
71 to 80 years....	4	4	8	10	10	20	2	.....	2	16	14	30
81 to 90 years....	.....	3	3	2	7	9	1	.....	1	3	10	13
91 to 100 years....	.....	.....	1	.....	1	.....	.....	.....	1	.....	1	1
100 to 110 years....	.....	.....	1	.....	1	.....	.....	.....	1	.....	1	1
Not stated.....	.....	.....	9	.....	9	1	.....	1	10	.....	.....	10
Total.....	225	105	330	1,378	1,039	2,417	44	13	57	1,646	1,158	2,804

TABLE III.—DEATHS BY NATIONALITY.

Nation.	Em- ployees.	Nonem- ployees.	Total.
Antigua.....	3	26	29
Antilles.....		3	3
Argentina.....		1	1
Austria.....		3	3
Bahama Islands.....		1	1
Barbados.....	52	411	463
Bermuda Island.....		1	1
Bolivia.....		1	1
Canary Islands.....	1		1
Chile.....	1	2	3
China.....		55	55
Colombia.....	5	152	157
Costa Rica.....	3	6	9
Cuba.....		2	2
Curacao.....		3	3
Demerara.....	1	11	12
Dominica.....	2	2	4
Ecuador.....		4	4
England.....		7	7
Fortune Islands.....	1	2	3
France.....		11	11
Germany.....		2	2
Greece.....	1	5	6
Grenada.....	2	33	35
Guatemala.....		2	2
Guadeloupe.....	3	18	21
British Guiana.....	1	2	3
Hayti.....	1	6	7
Honduras.....	1	2	3
Holland.....		1	1
India.....		4	4
Italy.....	1	25	26
Jamaica.....	68	714	782
Japan.....		2	2
Martinique.....	2	60	62
Mexico.....		3	3
Montserrat.....	7	13	20
Nassau.....		6	6
Nevis.....	1	1	2
Nicaragua.....		5	5
Norway.....		2	2
Panama.....	7	749	756
Peru.....	3	16	19
Philippines.....		1	1
Porto Rico.....		1	1
Portugal.....		4	4
Russia.....	1	2	3
Scotland.....		1	1
St. Kitts.....	1	3	4
St. Lucia.....	5	57	62
St. Thomas.....		7	7
St. Vincent.....	5	17	22
Spain.....	1	34	35
Tobago.....		1	1
Trinidad.....	2	27	29
Turkey.....		1	1
United States.....	14	50	64
Venezuela.....	1	9	10
West Indies.....		1	1
Unknown.....	3	13	16
Total.....	200	2,604	2,804

TABLE IV.—CAUSES OF DEATHS OF EMPLOYEES.

Cause of death.	White.	Colored.	Total.
Alcoholism, acute and chronic.....	2	.....	2
Aneurysm.....	1	2	3
Cerebral hemorrhage.....	2	7	9
Appendicitis.....		1	1
Brain, softening of.....		2	2
Carbuncle.....		2	2
Cardio-renal disease.....		1	1
Cellulitis, streptococcic.....	1	.....	1
Dysentery, bacillary.....		1	1
Dysentery, unclassified.....		1	1
Diseases of the urethra, urinary abscess, etc.....		1	1
Endocarditis, acute and chronic.....		2	2
Epithelioma of oesophagus.....		1	1
Diseases of the arteries.....		2	2
Fever, malarial, estivoautumnal.....		2	2
Fever, typhoid.....		3	3
Heart, organic diseases of.....	1	11	12
Hodgkin's disease.....		1	1
Insane, general paralysis of.....		1	1
Manic depressive psychosis.....		1	1
Nephritis, chronic.....		20	20
Pellagra.....		1	1
Peritonitis, simple.....	1	1	2
Pneumonia, lobar.....	3	28	31
Pyelitis.....		1	1
Pyaemia, streptococcic.....		2	2
Syphilis, tertiary.....		2	2
Syphilis, secondary.....		1	1
Sarcoma of left hip and other structures.....		1	1
Tuberculosis, abdominal.....		1	1
Tuberculosis, disseminated.....	2	14	16
Tuberculosis, miliary.....		2	2
Tuberculosis, pulmonary.....	2	14	16
Tuberculosis, Psoas muscle and lymph nodes.....		1	1
Uremia.....		2	2
Ulcer, duodenal.....		3	3
Urethra, stricture of.....		1	1
<i>External causes.</i>			
Railroad traumatism.....	2	.....	2
Accidental traumatism, various.....	2	15	17
Drowning, accidental.....	3	18	21
Dynamite explosions.....		2	2
Electrocution, accidental.....		2	2
Suicide.....	1	.....	1
Homicide by firearms.....	1	.....	1
Other external violence.....		2	2
Total.....	24	176	200

TABLE V.—DEATH RATES AMONG AMERICANS ON THE ZONE.

	Average number.	Causes of death.	Number of deaths.	Annual average per 1,000.
White employees from the United States.	4,199	Disease.....	7	1.67
		External causes.....	7	1.67
		All causes.....	14	3.33
White women and children from the United States.	3,575	Disease.....	14	3.81
		External causes.....	1	.27
		All causes.....	15	4.08
White employees and their families from the United States.	7,774	Disease.....	21	2.70
		External causes.....	8	1.03
		All causes.....	29	3.73
All Americans on the Canal Zone. <sup>1</sup>	15,693	Disease.....	29	1.85
		External causes.....	20	1.27
		All causes.....	49	3.12

<sup>1</sup> Includes employees and their families and officers and enlisted men of the United States Army stationed on the Isthmus.

TABLE VI.—CAUSES OF DEATHS OF CIVIL POPULATION (EMPLOYEES AND NONEMPLOYEES) AND MILITARY AND PLACES WHERE CHARGEABLE.

Diseases.	Panama.	Colon.	Canal Zone.	Total.
<i>I. General diseases.</i>				
Typhoid fever.....	3	1	4	8
Malarial fever:				
Estivoautumnal.....	4	5	8	17
Tertian.....	2		1	3
Undetermined.....		1		1
Clinical.....	2			2
Cachexia.....	1	1		2
Smallpox.....	1			1
Varioloid.....	1			1
Measles.....	2	3		5
Whooping cough.....	3	3		6
Diphtheria and croup.....	6	4	2	12
Croup.....		5		5
Dysentery.....	3			3
Entemebic.....	1			1
Bacillary.....		2		2
Unclassified.....	1	1	1	3
Erysipelas.....	1			1
Leprosy.....			1	1
Purulent infection and septicemia.....	7	1		8
Pyaemia.....	2	2		4
Septicemia.....	7	2	2	11
Tetanus.....	9	1		10
Pellagra.....	25	15	7	47
Beriberi.....	8	1	2	11
Tuberculosis of the lungs.....	242	70	22	334
Acute miliary tuberculosis.....	10	1	2	13
Tuberculosis meningitis.....	10	3	1	14
Abdominal tuberculosis.....	4	1		5
Pott's disease.....		1		1
Tuberculosis of other organs.....	3		1	4
Disseminated tuberculosis.....	44	15	15	74
Rickets.....		1		1

TABLE VI.—CAUSES OF DEATHS OF CIVIL POPULATION (EMPLOYEES AND NONEMPLOYEES) AND MILITARY AND PLACES WHERE CHARGEABLE—Continued.

Diseases.	Panama.	Colon.	Canal Zone.	Total.
<i>I. General diseases—Continued.</i>				
Syphilis:				
Secondary.....	1			1
Tertiary.....	11	2		13
Hereditary.....	12	3		15
Period not stated.....	5	2		7
Cancer and other malignant tumors of the—				
Buccal cavity.....	7	2		9
Stomach and liver.....	6	2	1	9
Peritoneum, intestines, rectum.....	3	2	1	6
Female genital organs.....	8			8
Breast.....	1			1
Other organs and of organs not specified.....	9	5	1	15
Acute articular rheumatism.....	2			2
Chronic rheumatism and gout.....	1			1
Scurvy.....	1			1
Diabetes.....	1	1	1	3
Hodgkin's disease.....		1		1
Anemia:				
Primary, pernicious.....	1	1		2
Secondary, cause not determined.....	3	1		4
Other general diseases.....	3			3
Alcoholism:				
Acute or chronic.....	3	2	2	7
Acute.....	2	1		3
Chronic.....	3		1	4
<i>II.—Diseases of the nervous system and of the organs of special sense.</i>				
Encephalitis.....	1		1	2
Simple meningitis.....	9		1	10
Cerebrospinal fever.....	2			2
Pneumococcus meningitis.....	7		2	9
Locomotor ataxia.....	3			3
Other diseases of the spinal cord.....	1		2	3
Cerebral hemorrhage, apoplexy.....	22	16	6	44
Softening of the brain.....	2		2	4
Paralysis without specified cause.....	2	1		3
General paralysis of the insane.....	2		2	4
Other forms of mental alienation.....	2		1	3
Epilepsy.....	5	8	1	14
Convulsions (nonpuerperal) (5 years and over).....			1	1
Convulsions of infants (under 5 years of age).....	4	3	5	12
Neuritis.....			1	1
Other diseases of the nervous system.....	2	2	1	5
Tumor of the brain.....	1			1
Diseases of the ears.....	3			3
<i>III.—Diseases of the circulatory system.</i>				
Pericarditis.....	6	1		7
Acute endocarditis.....	10	1	2	13
Malignant endocarditis.....	2	1		3
Organic diseases of the heart.....	68	38	17	123
Diseases of the arteries, atheroma, aneurysm, etc.	3			3
Aneurysm.....	6		3	9
Arteriosclerosis.....	20	5	1	26
Embolism and thrombosis.....	2	2	2	6

TABLE VI.—CAUSES OF DEATHS OF CIVIL POPULATION (EMPLOYEES AND NONEMPLOYEES) AND MILITARY AND PLACES WHERE CHARGEABLE—Continued.

Diseases.	Pana- ma.	Colon.	Canal Zone.	Total.
<b>III.—<i>Diseases of the circulatory system—Contd.</i></b>				
Diseases of the lymphatic system (lymphangitis, etc.).....	3	.....	.....	3
Hemorrhage; other diseases of the circulatory system.....	3	.....	.....	3
<b>IV.—<i>Diseases of the respiratory system.</i></b>				
Acute bronchitis.....	41	39	4	84
Chronic bronchitis.....	8	22	1	31
Broncho-pneumonia.....	132	70	27	229
Pneumonia (unqualified).....	29	8	1	38
Lobar pneumonia.....	48	39	19	106
Pleurisy.....	2	.....	.....	2
Empyema.....	2	2	.....	4
Pulmonary congestion, pulmonary apoplexy.....	7	2	.....	9
Gangrene of the lungs.....	2	.....	.....	2
Asthma.....	5	.....	1	6
Pulmonary emphysema.....	1	.....	.....	1
Other diseases of the respiratory system.....	3	.....	.....	3
Abscess of lungs.....	.....	1	1	2
<b>V.—<i>Diseases of the digestive system.</i></b>				
Diseases of the mouth and annexa.....	1	.....	.....	1
Diseases of the pharynx.....	.....	1	.....	1
Diseases of the esophagus.....	2	.....	.....	2
Ulcer of the stomach.....	1	.....	.....	1
Other diseases of the stomach (cancer excepted).....	1	.....	.....	1
Acute gastritis.....	2	1	.....	3
Chronic gastritis.....	.....	3	.....	3
Acute indigestion.....	1	3	.....	4
Diarrhea and enteritis (under 2 years).....	279	37	17	333
Colitis.....	45	4	5	54
Diarrhea and enteritis (2 years and over).....	16	6	3	25
Colitis.....	2	1	.....	3
Ankylostomiasis.....	2	.....	.....	2
Intestinal parasites.....	.....	1	.....	1
Appendicitis and typhlitis.....	1	.....	.....	1
Acute appendicitis.....	1	1	.....	2
Chronic appendicitis.....	.....	1	1	2
Hernia, intestinal obstructions.....	7	2	1	10
Intestinal obstruction.....	7	.....	2	9
Other diseases of the intestines.....	3	1	2	6
Duodenal ulcer.....	3	.....	2	5
Cirrhosis of the liver.....	8	2	1	11
Other diseases of the liver.....	1	1	.....	2
Abscess of liver (unqualified).....	7	.....	.....	7
Cholecystitis.....	2	.....	.....	2
Simple peritonitis (nonpuerperal).....	11	5	1	17
Other diseases of the digestive system (cancer and tuberculosis excepted).....	2	.....	.....	2
<b>VI.—<i>Nonvenereal diseases of the genito-urinary system and annexa.</i></b>				
Acute nephritis.....	32	12	5	49
Bright's disease (chronic nephritis).....	74	68	17	159
Other diseases of the kidney and annexa.....	2	6	3	11
Pyelonephrosis.....	3	2	2	7

TABLE VI.—CAUSES OF DEATHS OF CIVIL POPULATION (EMPLOYEES AND NONEMPLOYEES) AND MILITARY AND PLACES WHERE CHARGEABLE—Continued.

Diseases.	Pana-ma.	Colon.	Canal Zone.	Total.
<b>VI.—Nonvenereal diseases of the genito-urinary system and annexa—Continued.</b>				
Diseases of the bladder.....	1			1
Cystitis.....	3		1	4
Diseases of the urethra, urinary abscess, etc.....	1		2	3
Stricture of the urethra, nonvenereal.....	2		2	4
Other diseases of the uterus.....	1			1
Salpingitis and other diseases of the female genital organs.....	2	1		3
<b>VII.—The puerperal state.</b>				
Accidents of pregnancy.....		1		1
Abortion.....	1		1	2
Puerperal hemorrhage.....	5			5
Other accidents of labor.....	3	1		4
Puerperal septicemia.....	2	2	3	7
Puerperal albuminuria and convulsions.....	2	2		4
Eclampsia.....	3	4	1	8
Following childbirth (not otherwise defined).....			1	1
<b>VIII.—Diseases of the skin and of the cellular tissue.</b>				
Gangrene.....	1	1		2
Carbuncle.....	2	1		3
Mycetoma.....	1			1
Other diseases of the skin and annexa.....	1			1
<b>IX.—Diseases of the bones and of the organs of locomotion.</b>				
Diseases of the bones (tuberculosis excepted).....	2			2
Osteomyelitis.....	1			1
<b>X.—Malformations.</b>				
Congenital malformations (stillbirth not included).....	7		1	8
<b>XI.—Diseases of early infancy.</b>				
Newborn child.....	1	1	3	5
Congenital debility, icterus, and sclerema.....	3	2	3	8
Premature birth.....	44	8	6	58
Congenital debility.....	23	6	1	30
Atrophy of infants.....	1	2		3
Malnutrition.....	49	12	15	76
Other causes peculiar to early infancy (including various consequences of labor).....	19	7	2	28
Lack of care.....		3		3
<b>XII.—Old age.</b>				
Senility.....	6			6
<b>XIII.—Affections produced by external causes.</b>				
<b>Suicide:</b>				
Poisoning.....	1	2		3
Hanging or strangulation.....	1	1	1	3
Drowning.....			1	1
Firearms.....	6	2		8
Cutting or piercing instruments.....			1	1

TABLE VI.—CAUSES OF DEATHS OF CIVIL POPULATION (EMPLOYEES AND NONEMPLOYEES) AND MILITARY AND PLACES WHERE CHARGEABLE—Continued.

Diseases.	Pana- ma.	Colon.	Canal Zone.	Total.
<b>XIII.—Affections produced by external causes—</b>				
Continued.				
Other acute poisonings.....	2	1	.....	3
Conflagration.....	2	6	.....	8
Burns (conflagration excepted).....	5	.....	1	6
Accidental drowning.....	9	8	23	40
Traumatism by—				
Firearms.....	2	1	2	5
Fall.....	5	2	5	12
Machines.....	3	2	.....	5
Other crushings.....	7	4	5	16
Railroad traumatism.....	3	.....	3	6
Dynamite traumatism.....	.....	.....	3	3
Injuries by animals.....	1	.....	.....	1
Electricity (lightning excepted).....	1	.....	1	2
Homicide by—				
Firearms.....	9	3	2	14
Cutting or piercing instruments.....	1	1	1	3
Other means.....	1	1	2	4
Fractures (cause not specified).....	.....	.....	2	2
Other external violence.....	4	1	.....	5
<b>XIV.—Ill-defined diseases.</b>				
Ill-defined organic disease.....	1	.....	.....	1
Cause of death not specified or ill-defined.....	41	22	4	67
Infections of undetermined origin.....	1	1	1	3
Total.....	1,765	696	343	2,804
Stillbirths.....	230	58	37	325
Grand total.....	1,995	754	380	3,129

TABLE VII.—CONSOLIDATED HOSPITAL REPORT.

	Re- main- ing Jan. 1.		Ad- mitted.		Died.		Dis- charged.		Trans- ferred.		Re- main- ing Dec. 31.	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
<b>ANCON HOSPITAL.</b>												
Panama Canal employ- ees.....	25	117	1,007	1,852	9	58	977	1,764	4	17	42	130
Panama Railroad em- ployees.....	6	75	142	660	3	33	135	637	.....	13	10	52
Panama pay patients.....	1	2	13	.....	3	.....	.....	.....	2	10	.....	1
Other pay patients.....	111	48	3,526	1,352	45	126	3,479	1,201	23	17	90	56
Charity patients.....	13	41	245	317	4	44	240	258	2	33	12	23
Total.....	155	282	4,922	4,194	61	264	4,831	3,860	31	90	154	262

TABLE VII.—CONSOLIDATED HOSPITAL REPORT—Continued.

	Re- main- ing Jan. 1.		Ad- mitted.		Died.		Dis- charged.		Trans- ferred.		Re- main- ing Dec. 31.		
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	
<b>ANCON HOSPITAL—CON.</b>													
<i>Insane department.</i>													
Panama Canal employ- ees.....	5	10	2	9	.....	.....	2	1	2	6	9	.....	6
Panama Railroad em- ployees.....	3	.....	8	.....	2	.....	2	.....	6	.....	1	.....	.....
Panama pay patients.....	18	165	39	94	5	34	14	22	1	15	37	188	188
Other pay patients.....	9	5	31	13	2	6	29	9	2	1	7	2	2
Charity patients.....	8	45	7	39	.....	.....	7	1	9	1	6	13	62
Total.....	40	228	79	163	7	51	45	44	10	37	57	259	259
Grand total.....	195	510	5,001	4,357	68	315	4,876	3,904	41	127	211	521	521
<i>Corozal farm.</i>													
Panama Canal employ- ees.....	11	45	14	45	.....	.....	14	34	1	2	10	54	54
<i>Chronic ward.</i>													
Charity patients.....	.....	26	.....	26	.....	.....	.....	17	.....	11	.....	24	24
<b>COLON HOSPITAL.</b>													
Panama Canal employ- ees.....	1	5	219	274	.....	.....	6	185	216	29	49	6	8
Panama Railroad em- ployees.....	1	10	105	398	.....	.....	27	92	289	13	84	1	8
Panama pay patients.....	1	22	132	3	11	.....	6	23	13	98	.....	1	1
Other pay patients.....	11	5	365	101	9	7	294	69	61	29	12	1	1
Charity patients.....	3	1	41	43	.....	.....	2	38	20	5	22	1	.....
Total.....	16	22	752	948	12	53	615	617	121	282	20	18	18
<b>PALO SECO LEPER ASYLUM.</b>													
Panama Canal employ- ees.....	.....	.....	.....	4	.....	.....	.....	.....	4	.....	2	39	39
Panama pay patients.....	3	35	.....	9	1	5	.....	.....	.....	.....	1	24	24
Charity patients.....	2	18	.....	8	1	2	.....	.....	.....	.....	.....	.....	.....
Total.....	5	53	.....	21	2	7	.....	.....	.....	4	3	63	63
<b>GRAND TOTALS.</b>													
Panama Canal employ- ees.....	42	177	1,242	2,184	9	66	1,177	2,016	40	81	58	198	198
Panama Railroad em- ployees.....	7	88	247	1,066	3	62	227	928	13	103	11	61	61
Panama pay patients.....	21	202	63	248	9	53	20	45	16	123	39	229	229
Other pay patients.....	131	58	3,922	1,466	56	139	3,802	1,279	86	47	109	59	59
Charity patients.....	26	131	293	433	5	55	279	304	8	72	27	133	133
Total.....	227	656	5,767	5,397	82	375	5,505	4,572	163	426	244	680	680

TABLE VIII.—CONSOLIDATED REPORT OF EMPLOYEES TREATED IN QUARTERS.

Stations.	Re- mainning Jan. 1.		Ad- mitted.		Died.		Dis- charged.		Trans- ferred.		Re- mainning Dec. 31.	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Ancon.....	5	.....	1,238	29	.....	.....	1,223	25	20	4	.....	.....
Balboa.....	3	6	1,107	280	.....	.....	1,057	174	48	112	5	.....
Pedro Miguel.....	2	.....	158	6	.....	.....	151	4	9	2	.....	.....
Paraíso.....	1	2	210	55	.....	.....	195	54	15	2	1	1
Gamboa.....	.....	7	23	.....	.....	.....	4	21	3	2	.....	.....
Gatun.....	1	2	148	61	.....	.....	143	56	5	4	1	3
Colon.....	2	11	934	905	.....	.....	934	899	.....	.....	2	17
Total.....	14	21	3,802	1,359	.....	.....	3,707	1,233	100	126	9	21

CONSOLIDATED REPORT OF DAYS LOST BY EMPLOYEES IN QUARTERS.

Stations.	White.		Colored.		Total.	
	W.	C.	W.	C.	W.	C.
Ancon.....	2,399	.....	147	.....	2,546	.....
Balboa.....	2,815	.....	729	.....	3,544	.....
Pedro Miguel.....	447	.....	18	.....	465	.....
Paraíso.....	508	.....	134	.....	642	.....
Gamboa.....	25	.....	38	.....	63	.....
Gatun.....	450	.....	310	.....	760	.....
Colon.....	2,523	.....	6,238	.....	8,761	.....
Total.....	9,167	.....	7,614	.....	16,781	.....

TABLE IX.—CONSOLIDATED HOSPITAL AND EMPLOYEES TREATED IN QUARTERS REPORT.

	Re- main- ing Jan. 1.		Ad- mitted.		Died.		Dis- charged.		Trans- ferred.		Re- main- ing Dec. 31.	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Hospitals.....	227	656	5,767	5,397	82	375	5,505	4,572	163	426	244	680
Quarters.....	14	21	3,802	1,359	.....	.....	3,707	1,233	100	126	9	21
Total.....	241	677	9,569	6,756	82	375	9,212	5,805	263	552	253	701

TABLE IX.—CONSOLIDATED HOSPITAL AND EMPLOYEES TREATED IN QUARTERS REPORT—Continued.

	White.	Colored.	Total.
Total admissions to hospitals, excluding Corozal farm and chronic ward.....	5,753	5,326	11,079
Total admissions of employees to quarters.....	3,802	1,359	5,161
Total.....	9,555	6,685	16,240
Less number of patients transferred from quarters to hospitals, and between hospitals, whose admissions are duplicated in above figures.....	262	539	801
Net admissions to hospitals and quarters.....	9,293	6,146	15,439
Employees admitted to hospitals, excluding Corozal farm.....	1,475	3,205	4,680
Employees admitted to quarters.....	3,802	1,359	5,161
Total admissions of employees.....	5,277	4,564	9,841
Less transfers between hospitals, etc.....	152	308	460
Net admissions of employees to hospitals and quarters.....	5,125	4,256	9,381
Annual average per 1,000 of admissions of employees to hospitals and quarters.....	1,125.88	148.69	282.76

## CONSOLIDATED DISPENSARY REPORT OF ALL CASES TREATED BUT NOT EXCUSED.

Stations.	Employees.			Nonemployees.			Total.		
	White.	Colored.	Total.	White.	Colored.	Total.	White.	Colored.	Total.
Ancon.....	30,520	46,827	77,347	22,597	31,075	53,672	53,117	77,902	131,019
Balboa.....	39,766	45,133	84,899	14,371	10,120	24,491	54,137	55,253	109,390
Pedro Miguel.....	8,571	12,959	21,530	8,208	4,564	12,772	16,779	17,523	34,302
Paraiso.....	11,146	33,047	44,193	7,838	10,082	17,920	18,984	43,129	62,113
Gamboa.....	534	1,951	2,485	323	4,413	4,736	857	6,364	7,221
Gatun.....	4,896	18,059	22,955	9,891	16,734	26,625	14,787	34,793	49,580
Colon.....	12,108	34,991	47,099	9,709	10,473	20,182	21,817	45,464	67,281
Total.....	107,541	192,967	300,508	72,937	87,461	160,398	180,478	280,428	460,906

TABLE X.—AVERAGE NUMBER OF EMPLOYEES CONSTANTLY SICK IN HOSPITALS AND QUARTERS.

	White.	Colored.	Total.
<b>Hospitals:</b>			
Ancon Hospital.....	47.46	187.19	234.65
Colon Hospital.....	8.30	15.60	23.90
Palo Seco Leper Asylum.....		.71	.71
Total.....	55.76	203.50	259.26
<b>Quarters:</b>			
Ancon.....	6.57	.40	6.97
Balboa.....	7.71	2.00	9.71
Pedro Miguel.....	1.22	.05	1.27
Paraiso.....	1.39	.37	1.76
Gamboa.....	.07	.10	.17
Gatun.....	1.23	.85	2.08
Colon.....	6.91	17.09	24.00
Total.....	25.10	20.86	45.96

AVERAGE NUMBER OF EMPLOYEES CONSTANTLY SICK.

	White.	Colored.	Total.
<b>Hospitals.....</b>			
Quarters.....	55.76	203.50	259.26
Total.....	25.10	20.86	45.96

AVERAGE NUMBER OF EMPLOYEES CONSTANTLY SICK PER 1,000.

	White.	Colored.	Total.
<b>Hospitals.....</b>			
Quarters.....	12.25	7.11	7.81
Total.....	5.51	.73	1.39

TABLE XI.—AVERAGE LENGTH OF STAY IN HOSPITALS OR QUARTERS FOR EACH ADMISSION OF SICK EMPLOYEE.

	White.	Colored.	Total.
<b>Hospitals:</b>			
Ancon Hospital.....	15.40	27.17	23.53
Colon Hospital.....	9.52	8.64	8.93
Total (average).....	14.10	23.31	20.44
<b>Ancon.....</b>			
Balboa.....	1.93	5.07	2.00
Pedro Miguel.....	2.55	2.55	2.55
Paraiso.....	2.79	3.00	2.80
Gamboa.....	2.42	2.39	2.41
Gatun.....	3.71	1.65	2.10
Colon.....	3.04	5.17	3.65
Total (average).....	2.70	6.94	4.78
<b>Total (average).....</b>			
	2.41	5.60	3.25

TABLE XII.—PATIENTS OTHER THAN EMPLOYEES TREATED IN HOSPITALS AND AMOUNTS RECEIVED FOR THEIR TREATMENT (INCLUDING PALO SECO LEPER ASYLUM).

	Number of admissions.	Number of days treatment.	Revenue received.
Paid for by Panama Republic:			
Insane.....	130	65,957	\$57,102.00
Colon Hospital.....	154	354	904.40
Palo Seco Leper Asylum.....	10	14,900	10,660.57
Total.....	294	81,211	68,666.97
For whom department of civil government pay \$2,400 per year (charity patients).....	687	44,538	2,400.00
Outside pay patients.....	578	9,242	44,232.98
Families of employees.....	2,979	42,677	49,207.21
Soldiers.....	2,021	29,557	50,994.51
Public health service.....	202	4,038	6,148.49
Residents of Panama, emergency charity cases.....	23	161	.....
Total.....	6,784	211,424	221,650.16

TABLE XIII.—SURGICAL OPERATIONS PERFORMED IN HOSPITALS.

	Ancon Hospital.		Colon Hospital.		Total.	
	Number.	Died.	Number.	Died.	Number.	Died.
Amputations:						
Shoulder.....	2	.....	.....	.....	2	.....
Arm.....	1	1	.....	.....	1	1
Forearm.....	2	.....	1	.....	3	.....
Thigh.....	2	1	.....	.....	2	1
Leg.....	4	.....	.....	.....	4	.....
Foot.....	1	.....	.....	.....	1	.....
Digits, multiple.....	9	.....	2	.....	11	.....
Leg, double.....	3	.....	.....	.....	3	.....
Operations on bones:						
Cranectomy, decompressive.....	5	1	.....	.....	5	1
Cranectomy, exploratory.....	.....	.....	1	.....	1	.....
Laminectomy.....	1	1	.....	.....	1	1
Osteectomy.....	22	.....	4	.....	26	.....
Resection of knee (arthroscopy of knee joint).....	4	.....	.....	.....	4	.....
Wiring of fractures—						
Simple.....	22	.....	.....	.....	22	.....
Compound.....	11	1	.....	.....	11	1
Bone transplantation.....	1	.....	.....	.....	1	.....
Adenectomy:						
Cervical.....	18	.....	.....	.....	18	.....
Axillary.....	3	.....	.....	.....	3	.....
Inguinal—						
Single.....	167	.....	3	.....	170	.....
Double.....	42	.....	1	.....	43	.....
Femoral.....	16	.....	3	.....	19	.....

TABLE XIII.—SURGICAL OPERATIONS PERFORMED IN HOSPITALS—Continued.

	Ancon Hospital.		Colon Hospital.		Total.	
	Number.	Died.	Number.	Died.	Number.	Died.
Herniotomy:						
Inguinal—						
Single.....	80		36		116	
Double.....	13		15		28	
Femoral.....	2				2	
Ventral.....	9				9	
Strangulated.....			1		1	
Genito-urinary tract:						
Nephrotomy.....	2		1		3	
Nephrectomy.....	2				2	
Nephropexy.....	3				3	
Ureterotomy.....	2				2	
Urethrotomy—						
Internal.....	10	1	1		11	1
External.....	19	1	1		20	1
Prostatectomy.....	2				2	
Varicocele, radical cure.....	23		6		29	
Hydrocele—						
Single, radical cure.....	24		4		28	
Double, radical cure.....	5				5	
Orchidectomy.....	4		1		5	
Epididymotomy.....	109		3		112	
Amputation of the scrotum.....	7				7	
Amputation of the penis.....	1				1	
Curettage uteri.....	84		23		107	
Perineoplasty.....	17				17	
Trachelorrhaphy.....	12		3		15	
Vaginal punctures.....	1				1	
Obstetrical:						
Cæsarian section—						
Abdominal.....	9	3			9	3
Vaginal.....	1				1	
Accouchement force.....	2	1			2	1
High forceps.....	2		1		3	
Low forceps.....	7		1		8	
Version.....	5		1		6	
Perineorrhaphy.....	5		4		9	
Thorax:						
Thoracotomy.....	3	1	2		5	1
Excision of breast and axilla.....	1				1	
Rectum:						
Hemorrhoids, radical cure.....	97	2	9		106	2
Fistula in anus, excision of.....	20		2		22	
Prolapsus rectum, radical excision.....			1		1	
General:						
Thyroidectomy.....	8				8	
Aneurismorrhaphy.....	1		1		2	
Varicose veins, excision of.....	15				15	
Tenorrhaphy.....	13		8		21	
Myorrhaphy.....	2		3		5	
Excision of surface neoplasms.....	31		4		35	
Gunshot wound of soft parts, operation for.....			2		2	
Stab wound of soft parts, operation for.....			3		3	

TABLE XIII.—SURGICAL OPERATIONS PERFORMED IN HOSPITALS—Continued.

	Ancon Hospital.		Colon Hospital.		Total.	
	Number.	Died.	Number.	Died.	Number.	Died.
<b>General—Continued.</b>						
Extensive injuries to soft parts, operation.....			14		14	.....
Plastic operation for—						
Congenital defect.....	4				4	.....
Severe injuries.....	7				7	.....
Effects of disease.....	11	1			11	1
Skin graft.....	3				3	.....
<b>Laparotomy:</b>						
For general peritonitis.....	5	2			5	2
For tuberculous peritonitis.....	6	4			6	4
For intestinal obstruction.....	6				6	.....
Exploratory.....	15	2			15	2
Gastrotomy.....	1				1	.....
Gastro-enterostomy.....	11	2	3		14	2
Enter-enterostomy.....	1				1	.....
Enterectomy.....	4	2			4	2
Appendectomy.....	130		43		173	.....
Appendectomy with local peritonitis.....	19	1	5	1	24	2
Colostomy.....	3	1			3	1
Sigmoidopexy.....	1				1	.....
Cholecystotomy.....	3				3	.....
Cholecystostomy.....	2				2	.....
Cholecystectomy.....	6		1		7	.....
Choledochotomy.....	2				2	.....
Abscess of liver:						
Laparo-hepatotomy for Thoraco-hepatotomy for.....	2				2	.....
Splenectomy.....	2	1			2	1
Pan-hysterectomy.....	1		1		2	.....
Supravaginal hysterectomy.....	4	1	7		11	1
Hysteromyomectomy.....	51	4			51	4
Myomectomy.....	40				40	.....
Salpingectomy:						
Single.....	1				3	.....
Double.....	7				7	.....
Salpingo-oophorectomy.....	5				5	.....
Ovarian cystectomy.....	23		2	1	25	1
Oophorectomy.....	11		2		13	.....
Suspensio-uteri.....	5				5	.....
Plastic operation for chronic pelvic peritonitis.....	43		10		53	.....
For ectopic gestation.....	5				5	.....
Pylorectomy.....	1				1	.....
Gastrectomy.....	3				3	.....
For trauma:						
Rupture of spleen.....	4				4	.....
Major operations, various others.....	21	2	3		24	2
Minor operations:						
Various.....	1,341	3	98		1,439	3
Various (dispensary).....				1,658	1,658	.....

TABLE XIV.—OPERATIONS AND WORK PERFORMED IN EYE, EAR, NOSE, AND THROAT CLINICS.

	Number.		Number.
Adenoideectomy.....	182	Removal of steel from eyeball	
Advancement of internal rectus.....	2	(magnet).....	1
Antral sinusotomy, intranasal.....	1	Removal of foreign body from	
Abscess, mastoid region.....	1	nose.....	1
Enucleation.....	4	Sinusotomy, frontal.....	5
Evisceration.....	2	Submucous resection of nasal	
Excision of chalazion.....	1	septum.....	100
Expression.....	2	Sinusotomy, maxillary.....	1
Extraction of cataract.....	7	Tonsillectomy.....	229
Frontal sinus radical.....	2	Trephine Fergus Elliott.....	1
Iridectomy.....	1	Trephine of sclera for chronic	
Mastoidectomy.....	10	glaucoma.....	1
Plastic—		Various minor operations.....	57
Face.....	1	Turbinectomy.....	27
Nose.....	2		
Pterygium—		Total.....	681
Excision.....	22	Refractions.....	1,378
Transplantation.....	17	Outside cases treated.....	7,644
Perforation right antrum.....	1		

TABLE XV.—CONSOLIDATED WARD LABORATORY REPORT ANCON AND COLON HOSPITALS.

Blood examinations.....	7,901	Urine examinations.....	22,357
Estivoautumnal.....	831	Albumin.....	5,140
Tertian.....	198	Casts.....	4,460
Mixed tertian and estivoau- tumnal.....	3	Sugar.....	1,484
Quartan.....	8	Pus and blood.....	8,252
Differential blood counts.....	271	Indican.....	881
Leucocyte counts.....	946	Epithelia.....	9,575
Red blood counts.....	69	Bile.....	296
White blood counts.....	115	Trichomonas vaginalis.....	3
Hemoglobine estimations.....	1,420	Hemin crystals.....	48
Filariasis.....	1	Guaiac tests.....	431
Spirilla of relapsing fever.....	3	Ciliated monads.....	35
Stool examinations.....	7,274	Triple phosphates.....	62
Ascaris lumbricoides.....	110	Red blood cells.....	7
Uncinaria ova.....	301	Quantitative estimation of	
Tricocephalus dispar.....	258	albumen in urine.....	22
Strongyloides intestinalis.....	176	Urea determinations.....	3
Amoeba.....	22	Acetone tests.....	84
Entamoeba.....	5	Calcium oxalates.....	10
Ciliated monads.....	167	Benzidine tests.....	15
Bilharzia.....	2	Sputum examinations.....	3,419
Pus and blood.....	624	Tubercle bacilli.....	313
Entamoeba, histolytica and		Pus cells.....	9
tetragena.....	38	Pneumococci.....	8
Guaiac tests.....	199	Diphtheria.....	2
Cercomonas, intestinalis.....	22	Smear examinations.....	560
Tenia saginata dispar (ova).....	14	Examinations of spinal fluid.....	74
Blood and mucous.....	3	Examinations of vaginal	
Benzidine tests.....	1	and urethral discharges.....	287
Oxyuris, vermiculosis.....	4	Examinations of urine sedi- ment.....	15
Uncinaria (parasites).....	2	Eye.....	17
		Various.....	29

TABLE XVI.—SANTO TOMAS HOSPITAL.

Class.	Remain-ing Jan. 1.	Ad-mitted.	Died.	Dis-charged.	Remain-ing Dec. 31.
Pay patients.....	40	840	31	834	15
Charity patients.....	411	9,991	976	9,010	416
Total.....	451	10,831	1,007	9,844	431

Class.	Number treated.	Americans.		Other nations.	
		White.	Black.	White.	Black.
Pay cases.....	880	33	9	313	525
Charity cases.....	10,402	52	4	993	9,353
Total.....	11,282	85	13	1,306	9,878

Number of days relief furnished patients.....	163,587
Average number of patients constantly sick.....	447
Average number of days' treatment per patient.....	14.50

Operations, surgical:		Number.	Died.
Major.....		1,237	48
Minor.....		527	.....
Total.....		1,764	48

## DISPENSARY REPORT.

Class.	White.	Colored.	Total.
Natives.....	322	7,391	7,713
Foreigners.....	568	4,386	4,954
Total.....	890	11,777	12,667

TABLE XVII.—SANITATION.

## CITY OF PANAMA.

Mosquito, rat, and fly work:		
Ditches dug.....	miles..	2.1
Ditches cleaned.....	do....	88.4
Pools oiled.....	acres..	745
Water containers treated.....		153,738
Mosquito-breeding places found (stegomyia—1568).....		3,304
Flies trapped (13,000 to quart).....	quarts..	606
Fly-breeding places destroyed.....		299
Vegetation removed.....	acres..	57
Rats trapped.....		12,263
Disinfection work: Rooms disinfected.....		175
Material used:		
Crude oil.....	gallons..	45,520
Larvicide.....	do....	6,732
Kerosene.....	do....	737
Inspection of houses and yards:		
Houses inspected.....		52,232
Old buildings condemned.....		166
Buildings demolished.....		57
Plans for new buildings approved.....		247
Permits granted for repairs to old buildings.....		1,111
Notices served and nuisances abated.....		4,495
Private properties cleaned.....		55
Street cleaning:		
Square yards cleaned daily.....		600,000
Square yards sprinkled daily.....		55,209
Garbage collections:		
Loads of garbage removed to dump and burned.....		59,053
Cans of garbage emptied.....		507,931
Vaccinations: Persons vaccinated.....		1,949

## COLON, CRISTOBAL, AND MOUNT HOPE.

Water and sewers:		
Connections made during the year.....		143
Total connections made to date.....		1,368
Outstanding permits, December 31.....		30
Houses in which extensions were made.....		80
Houses:		
Plans approved.....		102
Permits to repair issued.....		587
Permits to occupy issued.....		186
Bills collected for work done for private parties.....		1,891
Sanitation of Colon:		
Loads of yard garbage removed.....		6,943
Cans of garbage removed.....		744,630
Private properties cleaned.....		8,880
Acres of vegetation removed.....		671
Acres of streets cleaned.....		9,731
Acres of alleys cleaned.....		1,647
Acres of streets sprinkled.....		615
Linear feet of ditches constructed.....		11,295
Miles of ditches maintained.....		516
Acres of pools oiled.....		138
Square yards of streets oiled.....		17,313
Gallons of oil used for streets.....		6,250
Mosquito-breeding places destroyed.....		140
Water receptacles treated.....		608,877
Mosquitoes caught on hospital screens.....		11,447
Fly-breeding places destroyed.....		163
Buildings inspected.....		122,971
Nuisances abated.....		3,991
Rats killed.....		3,316
Dogs killed.....		275
Cubic yards fumigated.....		12,521
Gallons of crude oil used.....		10,843
Gallons of larvicide issued.....		1,998

TABLE XVII.—SANITATION—Continued.

## COLOR, CRISTOBAL, AND MOUNT HOPE—Continued.

## Sanitation of Cristobal:

Square yards of pools oiled.....	107,491
Acres of vegetation removed.....	2.75
Water receptacles treated.....	95,335
Mosquito-breeding places destroyed.....	21
Fly-breeding places destroyed.....	38
Buildings inspected.....	17,270
Nuisances abated.....	574
Loads of garbage removed.....	2,289
Cans of garbage removed.....	170,757
Gallons of crude oil used.....	3,487
Gallons of larvacide used.....	215

## Sanitation of Mount Hope:

Acres of pools oiled.....	307
Acres of vegetation removed.....	520
Miles of ditches maintained.....	49.3
Water receptacles treated.....	160,100
Mosquito-breeding places destroyed.....	1,256
Miles of ditches constructed.....	2.9
Cans of garbage removed.....	15,065
Gallons of crude oil used.....	26,230
Gallons of larvacide used.....	1,593
Mosquitoes caught—	
In quarters.....	17,862
In barracks.....	25,178
On boats.....	1,197

## CANAL ZONE.

## Work requests on supply department:

Grass cutting.....	270
Screen repairing.....	101
Miscellaneous.....	103

## Work requests on municipal engineering department.....

186

## Work requests on other departments.....

23

## Buildings inspected:

For screening.....	13,029
For mosquitoes.....	63,100
For general sanitation.....	27,191
For safety.....	26

## Inspections of stores.....

394

## Inspections of restaurants.....

66

## Inspections of shops.....

783

## Notices served for abatement of nuisances.....

41

## Arrests for violations of sanitary regulations.....

9

## Convictions.....

7

## Garbage cans emptied daily.....

2,959

## Closets disinfected.....

10,974

## Houses fumigated or disinfected.....

23

## Mosquitoes destroyed in houses:

Adult anopheles.....	51,862
Adult culices.....	147,936
Adult stegomyia.....	1,215
Adult mansonia.....	61,580

## Number of containers found with stegomyia larvæ.....

20

## Fly-breeding places destroyed.....

20

## Rats destroyed.....

7,289

## Material used:

Crude oil.....	gallons.. 141,673
Larvacide.....	.do..... 6,604
Kerosene.....	.do..... 7,225

TABLE XVIII.—QUARANTINE SERVICE.  
PORTS OF PANAMA-BALBOA AND COLON-CRISTOBAL.

Vessels inspected and passed.....	2,155
Vessels detained in quarantine.....	191
Vessels detained but sailing in quarantine.....	38
Supplementary inspections of vessels detained.....	664
Vessels fumigated on arrival.....	191
Vessels fumigated on departure.....	26
Crew inspected.....	134,086
Passengers inspected.....	44,309
Stowaways inspected.....	44
Total persons examined.....	178,439
Supplementary inspections.....	27,203
Persons vaccinated at ports of arrival because of compulsory vaccination law.....	3,813
Persons vaccinated at ports of departure or en route because of compulsory vaccination law.....	12,868
Total persons vaccinated.....	16,681
Persons held in quarantine at the detention stations to complete period of incubation of yellow fever or plague.....	4,375
Persons held in quarantine on board vessels to complete period of incubation of yellow fever and plague.....	21,405
Poliomyelitis suspects detained.....	45
Total persons held in quarantine.....	25,825
Persons landed from foreign ports:	
Cabin.....	20,524
Steerage.....	13,821
Total.....	34,345
Persons embarked for foreign ports:	
Cabin.....	20,483
Steerage.....	15,875
Total.....	36,358
Apparent decrease for the year from foreign ports:	
Cabin (increase).....	41
Steerage (decrease).....	2,054
Total (decrease).....	2,013
Persons arriving from coast towns on small craft.....	21,510
Persons embarked for coast towns on small craft.....	18,534
Apparent increase for the year from coast towns.....	2,976
Total number of persons landed.....	55,855
Total number of persons embarked.....	54,892
Excess over number embarked.....	963
Less number for Pacific ports.....	2,774
Apparent decrease for year.....	1,811
Immigrants recommended for rejection and deportation.....	311
Bills of health issued.....	2,159
Clearances issued.....	290
Inspections of docks.....	181
Inspections of vessels at docks.....	670

## BOCAS DEL TORO.

Vessels inspected and passed.....	206
Crews inspected and passed.....	15,204
Passengers inspected and passed.....	2,718
Passengers, in transit, inspected and passed.....	1,921

TABLE XIX.—PERSONNEL REPORT.

[Average number of employees at work during year.]

	1916	1915	Dec. 31, 1916.		
			Gold.	Silver.	Total.
Chief health office.....	4	4	3	-----	3
Medical storehouse.....	8	8	4	4	8
Quarantine service.....	45	42	12	34	46
Health office:					
Panama.....	159	162	12	140	152
Colon.....	172	153	10	148	158
Ancon Hospital.....	362	333	124	246	370
Colon Hospital.....	41	36	17	26	43
Santo Tomas Hospital.....	6	5	6	-----	6
Palo Seco Leper Asylum.....	29	27	2	34	36
Zone sanitation.....	124	118	6	115	121
Hospital farm.....	59	49	2	66	68
Dispensaries:					
Balboa.....	7	6	5	3	8
Gamboa.....	1	1	1	-----	1
Gatun.....	4	4	2	2	4
Paraíso.....	4	4	2	2	4
Pedro Miguel.....	3	3	2	1	3
Total.....	1,028	963	210	821	1,031

TABLE XX.—HOSPITAL AND TOTAL CASES OF MALARIA AMONG EMPLOYEES.

	Admissions.				Deaths.				Total cases.	
	White.		Colored.		White.		Colored.			
	Hos- pi- tal.	Total.								
January.....	10	19	30	30	-----	-----	-----	-----	40	49
February.....	15	18	26	27	-----	-----	-----	-----	41	45
March.....	8	11	7	9	-----	-----	-----	-----	15	20
April.....	6	9	12	13	-----	-----	-----	-----	18	22
May.....	7	8	20	22	-----	-----	-----	-----	27	30
June.....	20	24	38	38	-----	-----	1	1	58	62
July.....	26	30	88	89	-----	-----	-----	-----	114	119
August.....	14	21	63	63	-----	-----	-----	-----	77	84
September.....	9	10	28	29	-----	-----	-----	-----	37	39
October.....	18	18	19	19	-----	-----	1	1	37	37
November.....	3	3	12	13	-----	-----	-----	-----	15	16
December.....	8	9	15	15	-----	-----	-----	-----	23	24
Total.....	144	180	358	367	-----	-----	2	2	502	547

TABLE XX.—HOSPITAL AND TOTAL CASES OF MALARIA AMONG EMPLOYEES—Continued.

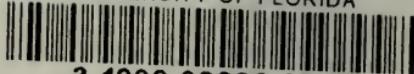
	Annual average per 1,000 deaths.		Annual average per 1,000 cases.		Number of employees.
	Hos-pital.	Total.	Hos-pital.	Total.	
January.....			15	19	31,223
February.....			16	18	30,497
March.....			5	7	33,084
April.....			6	8	33,856
May.....			9	10	34,393
June.....	0.38	0.38	22	24	31,501
July.....			40	42	33,787
August.....			28	30	33,609
September.....			13	14	33,528
October.....	.36	.36	13	13	33,272
November.....			5	5	35,031
December.....			8	8	34,327
Total.....	.06	.06	15	16	33,176







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